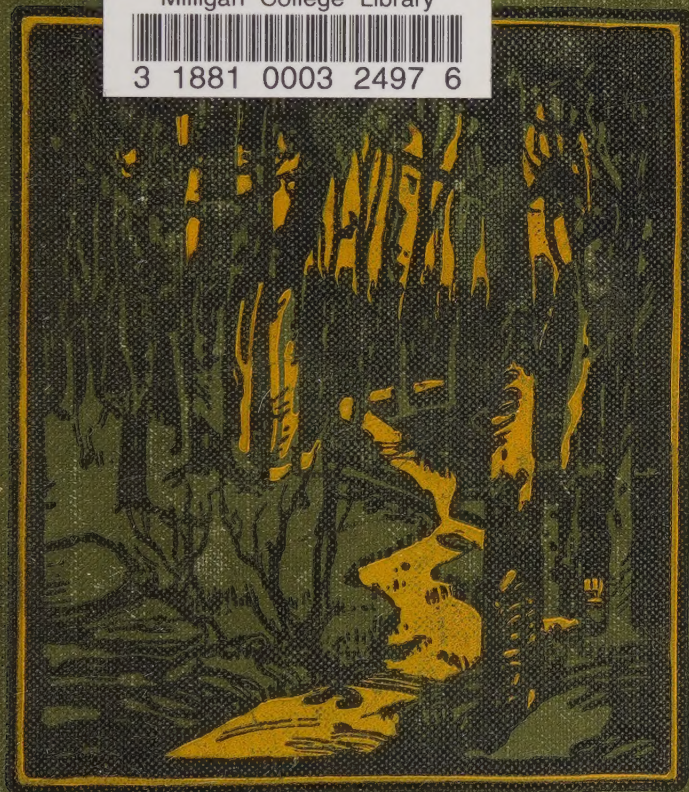


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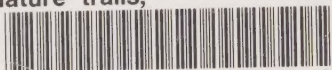
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NATURE TRAILS



A PATH TO THE FOUNTAINS OF YOUTH

NATURE TRAILS

BY
DIETRICH LANGE

PRINCIPAL OF THE GEORGE
WEITBRECHT MECHANIC ARTS
HIGH SCHOOL, ST. PAUL



ILLUSTRATED WITH
MANY PHOTOGRAPHS
BY THE AUTHOR

NEW YORK
D. APPLETON AND COMPANY

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PREFACE

The aim of this book is to arouse true appreciation of nature by spurring students to observe, investigate, and enjoy it for themselves. Many opportunities for firsthand observation and study of nature are offered not only in the forests and less frequented parts of the country, but also on farms and in city gardens and parks. The sketches that make up this book are based on the author's own observations made in many places: some in camps in the wild regions of the United States and Canada; some in towns and on farms; and others in urban gardens.

Included in the sketches are glimpses of various kinds of wild bird and animal life, stories about plants and trees, and observations on camping. No attempt has been made to present the information systematically, but an effort has been made to give the student some idea of the interesting things in nature which are on all sides, and of their relationship and significance to his own existence. The vocabulary of the book is simple enough for students in the sixth grade. The information, however, is valuable for more mature students.

The author believes that outdoor nature teaching is the most desirable form of instruction and that it should be made available to students wherever possible. The Appendix contains general suggestions for the amateur student as well as suggestive questions which should help him learn more about the subjects touched on in the book.

North America is blessed with a richer plant and animal life than Europe, and there is a surprising amount of wild

land within a few miles of most of our large cities. Deer in the wild state are found within fifty miles of New York City, and a surprisingly large number of birds may be seen in all the larger city parks.

Much pleasure is to be derived from hunting with a camera at all seasons and in many places. There are no game laws for the hunter with a camera, his game never spoils, and he never feels regret for the game he has shot. Most of the illustrations in this book are reproductions of photographs taken by the author.

Although the articles in this volume are all based on personal observations, the author has consulted the works of many writers. Hornaday's *The American Natural History*, Thompson Seton's *Life Histories of Northern Animals*, Comstock's *Manual for the Study of Insects*, Chapman's *Birds of Eastern North America*, the publications of the United States Department of Agriculture, and Britton and Brown's *Illustrated Flora* have been especially helpful.

Many suggestions have been derived from the writings of Henry Thoreau, John Burroughs, John Muir, Dallas Lore Sharp, Gilbert White, and others.

D. L.

CONTENTS

PART I

FALL

	PAGE
FOUNTAINS OF YOUTH	3
ADJEEDAHMO, THE PUCK OF THE PINES	5
MILES OF WILD FLOWERS <i>✓</i>	7
WILD HONEY . <i>✓</i>	9
WHY BIRDS MIGRATE	13
TAGGING A BEAR	15
AUTUMN WAVES OF BIRD LIFE	18
RED-WINGED ARMIES OF THE AIR	20
MUSHROOMS OR TOADSTOOLS? <i>✓</i>	22
FISH AND GAME	25
SOME HUMBLE OUTDOOR FOLK	27
GOOD NEIGHBORS <i>✓</i>	30
MORE ABOUT GRAY SQUIRRELS	32
THE WALKING ARSENAL	34
THE BUSH THAT BURNS	37
WILD HEMP	40
KEEPING PEACE WITH SHEEGAWK	42
THE SOIL UNDERFOOT	44
WINTER BERRIES FOR BIRDS	46
ESSEEPAN, THE COON	50
HOBCUSHA, THE WOODCHUCK	53

	PAGE
THE AGE AND GROWTH OF TREES	55
HOW NATURE TRIMS FOREST TREES	58
ORNAMENTAL NATIVE VINES	60

PART II

WINTER

WAIFS OF THE WOODLAND	65
FROGS IN WINTER	68
SOCIAL WASPS IN WINTER	71
A MYSTERIOUS IMMIGRANT	73
BRER RABBIT . ✓	75
A DEER CENSUS	78
REYNARD, THE FOX	82
ABOUT MUSKRATS ✓	85
THE EAGLE'S NEST	87
DO EAGLES EVER ATTACK?	90
SONGTOKECHA, THE COYOTE ✓	92
PATIENT PIONEERS 1	95
ABOUT HORSES . ✓	98
ON THE WINGS OF THE WIND	100
HOW NATURE STORES HER SEEDS	102
WHERE THE TREES HAVE GONE	104
GLEANERS IN THE WINTER WOODS , ...	108
FEEDING BIRDS IN WINTER	111
SOME TROUBLES OF TREES	113
THE MINK	115
THE LIFE OF A TRAPPER	118
TREE INDIVIDUALS	120
ATTRACTING BIRDS AND OTHER WILD LIFE	123

PART III

SPRING

	PAGE
POSSBLUMMIES	129
SPARE THE WILD FLOWERS	131
VIOLETS AND PANSIES	133
LITTLE BO-PEEP OF THE ORCHID WORLD	136
BOBWHITE	138
CHIPMUNK NEIGHBORS	141
LUCKY THIRTEEN	144
THE COWBIRD	147
THE HOME OF THE REDWINGS	150
THE TIDES OF BIRD LIFE	152
SOME STRANGE FACTS ABOUT ANGLEWORMS	154
HOW NATURE PLANTS FOREST TREES	155
A DESTRUCTIVE MANIA	158
A BIRD WITH A BAD HABIT	161
THE AMERICAN ROBIN	163
THE SNAPPING TURTLE	165
WHAT BECOMES OF THE DEER HORN	167
HOW ANIMALS GET THE NEWS	169
ANIMAL ENGINEERS	172
WHAT DOES A BEAVER KNOW?	174

PART IV

SUMMER

THE TRAIL OF NIAGARA	179
MEN OF THE STONE AGE	188
THE ORCHID FAMILY	191

	PAGE
A STRANGE NEST	194
POISONOUS SNAKES	196
THE DOBSONS	199
THE GREAT CICADA-KILLER	201
WONDERS OF THE SEACOAST	205
A STRANGE CREATURE OF THE SEACOAST	207
MOTHER LOVE OF A NIGHTHAWK	208
THE BEST WILD FRUIT	211
THE GREATEST BLUFFER	214
ALMOST FLOWERS	217
MILKWEEDS	220
WEED OR FLOWER?	222
AN INDIAN ORCHARD	225
SEA GULLS	227
THE GAME OF CAMPING OUT	230
ESSENTIALS OF CAMPING	233
SOME RULES OF GOOD CAMPING	237
APPENDIX	239
Suggestions for Outdoor Nature Study	239
Suggestions for Further Investigation, Study, and Discussion	242
Bibliography	251
INDEX	255

Part I
FALL

NATURE TRAILS

Fountains of Youth

The Spanish explorer, Ponce de Leon, journeyed to Florida in search of the Fountain of Youth. He failed to find the fabled fountain, but he passed many, many real fountains of youth which his senses were not able to recognize.

There are fountains of youth in the woodland and the field, in the streams and lakes, on the seashores, in little backyard gardens, and even in the desert.

In every place where man's eye can sweep the sky or rest on the green earth, where his ear can listen to the sound of wind and waves, to the song of birds and the music of the little players of the insect world, there are the fountains of youth.

Where violets and buttercups unfold to the breeze of spring, where bees and butterflies play and work on many-scented flowers, where the squirrels rustle through the autumn leaves, where the giant moose or the little wild mice make tracks and trails in the snow, there are the fountains of youth.

Of all the continents of the earth, it is North America upon which Nature has most lavishly poured from her horn of plenty.

Nowhere else has she provided so abundantly for man's body, and nowhere else does she so cordially invite him to feast his soul, that he may remain young and live long in the best of all lands.

No other continent has such lakes and streams. From Florida to the Arctic regions they are scattered in numbers that no man has yet counted.

It has been said that there is no longer a frontier, but that statement is true only in a historic sense. For the individual man or woman, most of the world will always be an unexplored frontier.

What matters it to the dweller of Manhattan that Hendrik Hudson explored the river named after him? What does the citizen of St. Louis learn from De Soto's discovery of the Mississippi? Only a few large and bare facts.

The charm of the wooded highlands on the Hudson, the wonders of the Father of Waters, with his hundreds of tributaries, his countless bends and islands, must be rediscovered by every person who would enjoy them.

And on our walks and rambles, or while delving in the garden patch, we may discover the mysterious fountain for which the old explorers searched in vain.

"Ten thousand things we may have fretted ourselves about, uselessly or worse. But to have lived in the sun, to have loved natural beauty, to have felt the majesty of trees, to have enjoyed the sweetness of flowers and the music of birds—so much, at least, is not vanity nor vexation of spirit."—Bradford Torrey.

Adjeedahmo, the Puck of the Pines

Most wild animals are shy, and many lead a partly nocturnal life; but little Red Puck with the bushy tail is the boldest and sauciest of the imps. The red squirrel may be seen winter and summer wherever there are trees. Reddy is as much at home in the parks of Washington, New York, and Boston as he is in the wild forests of Minnesota, Canada, and Alaska.

Two things each animal must find for itself—food and shelter. If there is anything edible which Reddy does not eat when he can get it, I have not discovered what that thing is. From the cones of pines and spruces he shells out the seeds as soon as they are edible; the bitter green skins and hard shells of black walnut, butternut, and hickory are no protection to the kernels within. During the nutting season, the lips and little hands of the squirrel are dyed a rich brown by the tannic substance in the outer green jackets of these wild nuts.

I have often wondered how the red squirrels know which mushrooms are harmless and which are poisonous. We humans have no instinctive knowledge of that kind, and must learn by experiment and direct teaching. But the red squirrels, all through their wide range from Chesapeake Bay to Labrador and Alaska, eat several kinds of mushrooms. I have seen them carry a kind I should have considered poisonous, but I have never heard of a squirrel being poisoned by

eating the wrong kind of mushrooms, although the dangerous kinds are fairly common everywhere. Red squirrels even store mushrooms in the open in the crotches of trees and eat them months later when they are dry.

In every place where I have camped, except on the plains and in the Bad Lands of the Dakotas, the red squirrel has come to look me over, usually before I had my tent pitched.

A camper may not see any one of half a dozen kinds of wild animals that live near his camp, but he cannot possibly miss the red squirrel. One does not have to scout and search for him; he calls promptly on all strangers. Sitting pertly on a safe branch, his tail curved over his back, he scolds and snickers at the intruder, but he is withal a shy neighbor, especially in suburbs and country, where there are dogs and cats.

Only once have I succeeded in taming red squirrels. Three of them had apparently lived in a cabin into which I moved one June in the Itasca Forest of Minnesota. At daylight one of the squirrels sat on the table near my bed and made the cabin ring with his chatter. I spent a day nailing up every hole I could find in the floor and walls of the cabin, and then I began feeding the squirrels on scraps of bread, pancakes, and meat, placed on a platform outside. Within a few days they would eat out of my partner's hands and mine, but they always remained nervous and distrustful. When they took pieces of bread out of my hands, I had to be watchful that they did not nip my fingers

in their hurry. They never showed that easy confidence displayed by the gray squirrels in the parks of many cities, and they were always quarreling among themselves.

Where they slept at night I could never find out. There were no hollow trees and no leaf nests near the cabin. I think it most likely they slept in nests under some stumps, because at dusk they always disappeared in the



THEY ALWAYS REMAINED NERVOUS
AND DISTRUSTFUL.

brush and among the stumps behind the cabin. At daylight they came back, but that was all I could learn about their sleeping quarters.

Miles of Wild Flowers

There is only one plant in Northwestern Europe which covers the landscape with a sheet of color. It is the heath or heather, which, in early August, covers large areas in Scotland, Jutland, and the Lueneburger Heide of Germany with a sheet of purple.

In North America, on the other hand, a number of species share in spreading color over the landscape.

Nearly all of these flowers that give distinct color to the landscape belong to the largest family of flowering plants, the composites, of which about 12,000 species are known.

It is the goldenrods, sunflowers, asters, coneflowers, bur marigolds, sneezeweeds, blazing stars, and thistles that in August, when the summer days begin to wane, lavish their colors on the land.

One who has once seen these great flower pictures of nature can never forget them.

One August we traveled through thirty miles of jackpine country from Lake Itasca to Park Rapids, and the road wound through a succession of acres of delicate purple asters.

During summers of low water, the Minnesota and Mississippi, and a hundred other rivers, and their marshes are fringed with miles and miles of the tall white boltonia aster. These tall flowers form great thickets whose total extent must be measured in hundreds of miles.

Every year the gold of sunflowers and Spanish needles is poured out over the margins of lakes, sloughs, and ditches, while hillsides and waste places are painted with the same hue by masses of goldenrods and coneflowers.

White, yellow, and purple are the principal colors of boltonias, sunflowers, goldenrods, asters, and thistles; but orange, sky-blue and true spectrum red are comparatively rare in nature.

In the northern states and Canada, orange is restricted to the Indian paint brush and the butterfly

weed, sky-blue to certain lobelias and gentians, while true spectrum red is restricted to a single flower, the exquisite scarlet lobelia, or cardinal flower.

In the moist woods along the St. Croix, the Mississippi, and its tributaries below the Twin Cities, the cardinal flowers catch the eye like tall, upright torches burning with an intensely red fire. I have never seen insects visit them, but they are much visited by hummingbirds.

No boy or girl should miss the opportunity of studying flowers. A knowledge of plants is an asset for life, and flowers are found everywhere, even in the desert.

Wild Honey

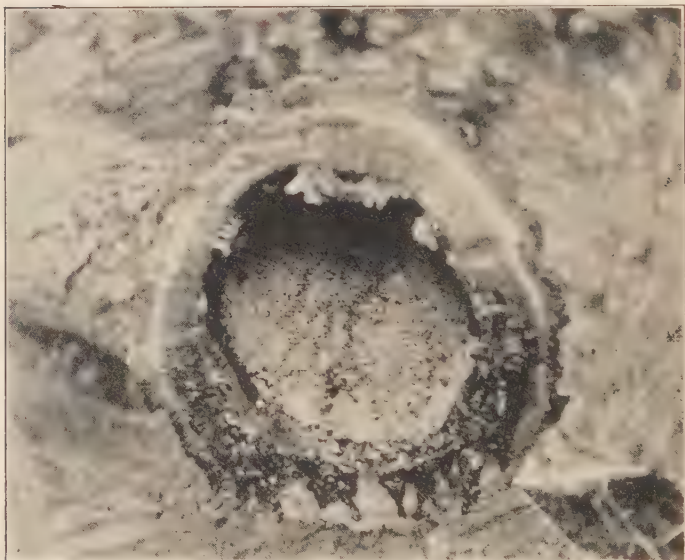
All honeybees are really wild, for their life with man has changed them but little, either in structure or in habit.

It does not seem to be generally known that there were no honeybees in America before they were introduced by the early French, English, and Spanish settlers.

The old histories contain, however, very little about the spread of the bees. The Indians called the swarms, which escaped and settled in hollow trees, "English flies." They hated bees because they came with the whites, but they quickly learned to eat the honey.

When the English botanist, Bartram, traveled in Florida in 1774, he found that wild bees had already spread over the peninsula at that time, and that both

Indians and whites were fond of the honey. About 1815 a party of surveyors in the forest south of Lake Erie ran out of provisions, and for two weeks lived on flour and wild honey, which they mixed with a little water, and then baked over the coals and in the ashes



A STORE OF HONEY IN A LARGE HOLLOW LIMB.

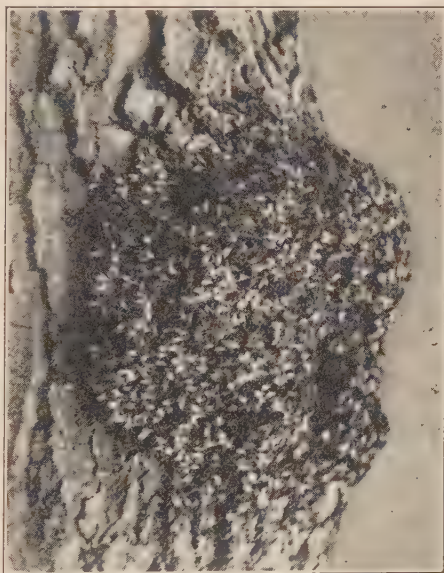
of their campfire. These are the first notes I have found of wild honeybees in America.

Honeybees must have lived in hollow trees for many thousand years, before man put them in hives made of straw, boards, or sections of logs.

It is remarkable how wild bees find suitable trees, and how many they find. I have hunted bees in low,

scrubby oak timber where I found three or four good colonies to the square mile. The bees may enter the trees through a knot-hole only a few inches above the ground, or at the height of a hundred feet. Sometimes they have a store of honey in a large hollow limb.

A strong colony in a good tree will have stored away in the fall from forty to sixty pounds of honey. If no accident befalls such a colony it may live for years in the same tree, and send out swarms as do hives that are cared for by a beekeeper.



A SWARM OF WILD BEES.

Most of the wild swarms consist of the beligerent black bees, who are great workers as well as great fighters. They seem to be better able to shift for themselves than the more gentle yellow, or Italian bees. Many wild swarms are too small or have to settle in poor shelter. These perish during the winter, and in spring other bees rob the deserted combs. For bees have only one passion: "Gather honey, more honey!"

To cut down a bee tree and rob the bees of their honey is cruel, and should be forbidden by law. In such a case the whole swarm is doomed to starvation, because in late summer or fall the bees cannot lay up a second store of honey, even if they should find another suitable hollow tree.

If the honey is taken, the bees should be carefully hived and taken home. A beekeeper is generally able to find the queen, and the bees will readily enter a hive which contains the queen.

I was surprised at the boldness with which two experienced bee hunters went at their work. They wore, of course, a veil and gloves, but when the tree was being sawed down and the log split, the bees were far more concerned in gorging themselves with honey than in defending their home. It looked as if the word had been passed: "The end of the world has come. Eat honey while you may!"

The sting of the bee is quite painful, and half a dozen stings may cause fever and symptoms of poisoning. I know of a man who was stung to death by his own bees. He was moving the hives, and some of them were opened by accident, and the excited bees fell upon him and his horses in such numbers that the man died from the stings.

It is a strange tragedy in nature that every bee that uses its sting in defense of the hive is doomed to die. The sting is provided with barbs and the bee cannot withdraw it from the wound, but in escaping must tear out its own vitals.

Why Birds Migrate

At first sight one would say that the birds go south just as humans do to escape the cold weather. But birds suffer very little from cold, provided they can secure plenty of food.

The main reason why so many birds leave us in the fall is found in the disappearance or inaccessibility of their food supply. Even the scarcity of their food, however, does not give the whole answer to our question.

The blue-winged teals and the mallards spend the summer on the same lakes, and eat substantially the same food; but the teals leave us in September or early in October, while the mallards stay till the lakes and marshes begin to freeze over; and some mallards remain near spring holes and patches of open water all winter.

The golden-headed blackbirds and the redwings nest in the same marshes. The redwings come very early in the spring and stay late into the fall. In the mild winter of 1920 a flock of several hundred redwings remained in Minnesota till the middle of January. The golden-heads on the other hand, do not reach this latitude, forty-five north, till the first week in May, and they go south in August, when all kinds of bird food is most abundant.

Some birds, like the kingfisher, and the redwings, put off going south as long as possible and then do not go far; while others, like the golden-heads and most of

the warblers, seem to be in a hurry to get back south.

One midwinter I happened to make a trip to Northern Indiana. To the north the streams and lakes were ice-covered, but the Wabash and its tributaries and the streams draining the famous Kankakee region were open, and the kingfishers were there. While the kingfisher is properly classed as a migratory bird, he does not migrate farther than he has to. When he finds open water he stops and begins fishing.

The winter of 1920-21 brought much cold weather and many storms to the Central West, but one kingfisher remained near St. Paul all winter. My friends and I saw or heard him through the months of January and February until the beginning of mild weather. He fished on an open stream, which is the outlet of a lake, properly named Spring Lake. I often wondered how he kept his wings from freezing on his back after his plunges for small sunfish and minnows.

And where did he sleep during the long winter nights, when a northwester shook my cabin and when the water froze within a few feet of my stove? Did he make the best of it among the dead leaves of the oaks, or did he crawl into his tunnel in the claybank, where his nest is found in the summer?

Of course, such birds of the air as swifts, martins, swallows, and nighthawks, who catch their insect food in the mid-air, have to migrate as soon as the weather gets cold, but in warm weather millions of swallows may be seen on our northern lakes and marshes as late as the last week of September.

Tagging a Bear

"What would a bear do if I met him in the woods?" I asked an old trapper.

"He would probably stop a few seconds," the woodsman replied, "but as soon as he had made out what you



OCCASIONALLY ONE MAY MEET HIM ON THE TRAIL.

are, he would run. If your bear should happen to be an old she-bear with cubs, it would be your turn to run."

One may live several seasons in a country where black bears, the only species of Eastern North America, are fairly common without ever seeing one. The bear's keen sense of smell and his ears generally tell him of

the presence of man long before the man is aware of him, and he avoids meeting the invader.

Occasionally, when the wind is wrong for the bear, and when he has not been hunted, one may meet him face to face on the trail. It was under these conditions that a United States forest ranger took this photograph of a wild bear in Northern Minnesota.

On one occasion, I helped to put a tag on a bear and then sent him back into the wild woods. It was in the month of July. Of all lean years in the wild country, it was the leanest I have ever experienced. A late frost had destroyed all wild fruit and berries. In localities where in a fat year one could have picked a bushel of blueberries and other wild fruit in a few hours, one could not pick a cupful by working all day.

It was the hunger of the lean year that made a young bear so bold that one night he invaded the workmen's grub tent, and carried away a slab of bacon. He came again and devoured all the butter in camp. A day or two later, he appeared in broad daylight and was very reluctant to give up his raid, even when one of the men yelled and threw stones at him.

This was too much for the men, who had to bring in their provisions from a town thirty miles away.

They were not allowed to shoot the bear, but they set about catching him alive. They dug a pit about six feet deep, and covered it with brush and thin boards, well greased with fragrant fat of bacon.

Early the next morning, the superintendent called me, saying, "Get up quick; the men have caught the bear."

We built a strong cage of timbers and woven wires. This cage we placed near the pit, in which the bear lay coiled up. He was a young bear weighing about a hundred pounds. When first caught he had made frantic efforts to escape, and one of the men had struck him on the head with the flat of an ax.

With a shovel we sloped off one of the walls of the pit. Young Bruin was wide awake now, but by means of a forked pole we put a rope around his neck and pulled him into the cage.

We kept him about six weeks, and he became fairly tame. In September we decided to let him go. Before we set him free, we put a loose chain around his neck. To the chain was fastened a small brass tag saying:

WRITE PROF. D. LANGE, ST. PAUL, MINN.

About six weeks later I received the following letter from a settler about fifteen miles north of the forest:

DEAR SIR:

A bear began to bother my corn patch some time ago. I fired at him one night but it was so dark that I missed him. A few nights later, I climbed a tree and waited for him. This time I had better luck and killed him. I was much surprised when my knife struck the chain with your tag on it.

My family and I enjoyed the meat very much. He was fat and tender, all corn-fed, and not a bit rank and gamey. Please let me know when you turn the next one loose.

If ever I have another chance to turn loose a tagged

bear, I shall provide him with a small bell in addition to a tag.

Bears are harmless, and should have the protection of game laws as have deer, elk, and moose.

Autumn Waves of Bird Life

The great tidal waves of bird life flow from south to north and back again from north to south as regularly as the tides of the ocean.

The number of birds that make up these great waves is almost inconceivably great, and nowhere else can one observe the hosts of winged travelers as intimately as on some northern lakes.

Standing on a bridge of the Bowstring River at Inger, just south of the great wild rice beds of the Big Fork, I have seen half a million ducks go by within a few hours. Such a flight may occur when a cold wave is approaching from the north, and nearly all the ducks on the thirty miles of rice beds start south on the same afternoon.

Of the former abundance of water fowl it may be difficult for the present generation to form a true conception. Frank Vance, who lived near my camp at the head of the Big Fork when that region was still Chippewa country, told me that one evening about twenty-five years ago when he and a companion paddled up the Popple River from my camp site, the mallards in the rice on both sides were so numerous that their quacking and flopping made it impossible for the two men to hear each other talk.

On Swan Lake in Nicollet county, one of the best water fowl lakes in the United States, I have many times seen the assembling of vast hosts of migrating birds.

From one point I have seen as many as 10,000 coots, or mudhens, on that lake. When their time comes to go, nearly all of them leave during the same night, perhaps 50,000 of them in one flock.

In the middle of the afternoon the blackbirds begin to arrive on Swan Lake in long scattered flocks. Flock follows flock, until there are tens of thousands of birds settling down to roost in the rushes. For more than two months they disperse every morning to their feeding grounds and return to the protection of the rushes in the evening.

In the rushes on Swan Lake I have watched the swallows drifting southward. When the sun rises in the morning, one may see thousands of them clinging to the bending rushes. Their white breasts look like countless tufts of white flowers bursting from the dark rushes, and the metallic luster of their wings glistens in the sun.

When the air has grown warm enough to invite winged insects to their mid-air play, the white breasts begin to take wing, and for an hour the air all around is alive with swallows.

There may be a million of them on the lake at one time, and I estimate that I have seen 20,000 near my boat. More than 90 per cent of them were the white-bellied tree swallows, who raise their young in the hollow trees near lakes and marshes. It is always a

marvel to me where they all come from. Their countless numbers make me feel as if all the tree swallows of North America must assemble on Swan Lake, but I know that they are just as numerous on many other rush-covered lakes throughout the Northwest.

Red-Winged Armies of the Air

The great flocks of red-winged blackbirds are a characteristic feature of American bird life. Europe and Asia have nothing to compare with these countless hosts that gather in late summer and fall on our lakes and marshes.

The redwings are at home over a large part of North America, from Florida and the Mexican state of Sonora to New Brunswick and the Mackenzie River in Canada. The males are easily identified by their general black plumage and red shoulder patches, but the females are brownish black above and heavily streaked with black below. The young males show a good deal of rust color, and their wing patches are less bright.

The nests of the redwings are neat warm baskets woven on the cat-tails and other rushes. In July, as soon as the young can fly, the birds begin to flock, and in August, when the wild rice begins to ripen, they gather in large flocks on the rice marshes and shallow lakes, where they may be found till November.

But to gain an idea of their immense numbers, one must see them gather on their roosting places or watch them depart to their feeding grounds in the morning.

They roost in the rushes of marshes and shallow lakes. About the middle of the afternoon the first stragglers appear, and from that time till after sunset there is a continuous succession of small and large flocks.

Thousands of them will gather for a short rest and



THEY GATHER IN FLOCKS ON MARSHES AND
SHALLOW LAKES.

social visit on trees near the lake or marsh, until the trees appear black with their numbers.

As the sun approaches the horizon, the birds begin to drop into the rushes, where their united calls and chatter produce a volume of sound which may be heard for half a mile.

I cannot help thinking that it must be cold and damp and uncomfortable in the rushes, but birds do not know the comfort of a warm bed or lair. They always sit up during sleep. In a cold driving rain-

storm, however, their slumbers must be much disturbed, even if their feathers do act as a combination of eider-down blanket and shingle roof.

The roosting place is safe from enemies; that is the main thing. Foxes, minks, weasels, and cats cannot surprise them, and owls cannot drop down upon them. Nor can man catch one redwing alive, although ten thousand may be roosting within a stone's throw.

I have taken a lantern and waded into the reed jungle after dark. The birds were sleeping within a foot or so of the water, and from above not one could be seen. As I advanced slowly, they arose and fluttered a few rods farther from shore, where they dropped back amongst the reeds. Not all their roosts consist of such dense jungles as the one I visited, but I am satisfied that no wading or swimming enemy could surprise the sleeping redwings.

At daylight the flocks sing again before they leave the lake. Shortly after sunrise, the whole army takes wing. In September and October I have seen from my duckboat two or three great flocks, each a mile long, blackening the sky, and I estimated that each flock contained from ten thousand to twenty thousand birds.

Mushrooms or Toadstools?

The old question how to distinguish mushrooms from toadstools, some wit has answered by saying, "Eat them. If you don't get sick or die, they were mushrooms."

The serious answer is that the two popular terms are not sufficient for a clear distinction. In common use mushrooms are edible fungi, and toadstools are poisonous fungi. It would be better to speak of edible and poisonous mushrooms.

There is no one item by which an edible mushroom



IT HAS THE SHAPE OF A CLOSED UMBRELLA.

can be distinguished from a poisonous one any more than there is one sign by which a poisonous snake can be distinguished from a harmless species. It is necessary to know the snake, or the mushroom in question; and it is as dangerous to make a meal of poisonous mushrooms as it is to let yourself be bitten by a venomous snake.

One of the most delicious edible mushrooms is the shaggy-mane or inky mushroom. It has the shape of a closed umbrella, and bits of dark fibers generally

adhere to the outside, giving it the characteristic shaggy appearance.

After a rain in late summer and autumn shaggy-manes break out of the ground overnight like Jonah's gourd. Within a few hours, the lower edge begins to look black, and within a day or less the whole head has turned into a black inky substance.

Mushrooms of this kind that have begun to turn dark are still good, but their color is not inviting. The plant is so very perishable that one can notice a change while one is preparing a mess for the pan.

A batch left in a basket overnight is likely to be spoiled by morning, but it is quite safe to keep them overnight in the ice box after they have been cooked.

All the common mushrooms lead a strange life underground or in dead wood. Innumerable threads of their tissue run in all directions and often combine into strands. At their appointed time, if the conditions are favorable, these scattered threads push up the structures known as toadstools or mushrooms.

On the under side of these heads millions of spores, or plant germs, are produced on gill-like structures. These spores are scattered by the wind and by other means, and from them a new growth of threads starts in the ground.

A certain plot of ground near my home produces a big crop of shaggy-manes every fall unless the season is very dry. Years ago the lot was filled up with street sweepings, making a fertile soil in which the shaggy-mane threads, or mycelium, live on from year

to year. After the fall rains their heads literally heave up the soil by the force of their rapid growth.

Fish and Game

It will require the most serious and concentrated effort to preserve an adequate stock of game and game birds in this country, but keeping up a supply of fish seems far less difficult.

Unless waters are polluted beyond all reason, or spawning grounds are ruined by the conventional useless dredging of lake shores, the powers of Nature to replenish exhausted waters will provide a permanent supply of fish.

A three-pound pickerel which I once examined contained 20,000 eggs. The eggs of this one fish, if all had hatched, would have been sufficient to stock ten lakes the size of that in which the pickerel was caught. When we consider that in the same lake were found carp, crappie, bass, perch, and bullheads, all of which are prolific breeders, it will be seen that there is no danger of exterminating our fish by catching them with hook and line.

It is different with game and game birds. Through good roads and the automobile, they are all threatened with practical extermination except in specially protected areas. By practical extermination, I mean that the bird or animal will become so rare that it cannot be found by looking for it in its natural haunts. This is already true of the woodcock and of several shore birds over the whole country; and it is true of the

ruffed grouse in all woods which are accessible from towns and cities in well settled regions.

For our fish there is, happily, no such danger. White men have fished in thousands of lakes and streams for centuries. There are still fish in these waters, but wild ducks and other game birds have practically disappeared from many lakes and streams, except where refuges have been established.

I do not recall that Izaak Walton tells his disciples anything about the joys of winter fishing, that is, of fishing through the ice. This sport may not be equal in exhilaration to wading a trout stream with a fly rod, but it is an excellent motive for getting a man out into the open at a time when most men stay indoors more than is good for the health of both body and spirit.

One might think that fish are dormant in winter, like turtles and frogs, but this is not true. They are more sluggish than in summer; but so far as I know nearly all of them keep up the hunt for food, although the temperature of the water and of their bodies is only a few degrees above freezing.

In all our fish that spawn in spring, the eggs begin to develop in midwinter, and, naturally, the growth of the eggs demands food.

Pickerel, especially, are very greedy feeders at all times. I have caught them by trolling in open waters as late as the middle of December, and have caught them through the ice all winter, except when there was much snow or snow-ice on the lakes. At such times, I think it was too dark in the water for them

to see the bait, and I caught very few or none, until the ice was clear of snow.

Some Humble Outdoor Folk

How some animals come by their reputations is a mystery, unless it can be explained on the theory that certain superstitions are as old as the hills.

The common spotted salamander, popularly called lizard, has the reputation of being fireproof, although his moist, naked skin is not any more fireproof than the human skin. Very likely the story comes down to us from Greek and Roman times, and it has no more foundation in fact than the belief in the influence of the moon upon the growth of plants, and in the wisdom of animals as long range weather prophets.

The spotted salamander, like the frog and the toad, spends its youth in the water, but the adults live on land. The harmless insectivorous creature is a little formidable to look upon, but its rather startling coloring of black and yellow is its main protection. It is in fact a warning color. As a last resort the salamander covers itself quickly with a white acrid sweat. It is the only real defense the creature has against cats, dogs, skunks, and other predatory creatures. The startling color combination is a kind of sign, which says to all hungry wood folk, "Let me go in peace. I am not good to eat." Young birds and beasts learn these lessons very quickly. I have seen a young wild duck avoid a large black fly after one trial.

The salamanders and frogs have never belonged to

a ruling class of life on earth. There has been an age of fishes, an age of reptiles, and an age of mammals; but there never was an age of batrachians, which is a group name for frogs, toads, and salamanders.



"LET ME GO IN PEACE. I AM NOT
GOOD TO EAT."

their winter quarters on land. In autumn they are frequently found in cellars, in the coal bin, or in a cellar window area. They crawl or tumble into these places in their effort to escape the frost, and at this time they show more intelligence than one would credit to the sluggish creatures as one comes upon them in garden or field.

Perhaps these creatures never developed into a ruling class because they hesitated. From a human point of view they could never make up their minds whether they would live in water or on land. In their youth they are all aquatic, but most of the adults are terrestrial.

Nearly all frogs hibernate in the water, but the spotted salamanders find

One salamander I found in the tunnel of a gopher, with whom he was preparing to spend the winter as an unbidden guest. Another I discovered digging into the soft black soil of a molehill on the first of November. He worked slowly, pushing back with his hind feet the dirt which he dug out with his fore feet. After working two hours, his tail only was visible. Next morning he had dug himself in, and had probably struck the mole's tunnel which led him to a frost-free depth.

At times the spotted salamanders are quite common, but in dry summers they seem to disappear completely. At such times the uninitiated would not be able to find one in the whole country, but two of my friends found dozens of them hiding in a dry well and waiting for rain. On such occasions they have to go without food for months at a time, and I have often thought that their apparently useless tails serve them as a kind of emergency reserve.

Only once have I seen the salamanders so abundant that they reminded me of the plague of frogs in Egypt. With some friends I started shortly after midnight on the first of September on a duck hunting trip from a small town. Every street was alive with salamanders, and from under every wooden sidewalk they came, apparently headed toward the light on our wagon. There were thousands of them, but just what caused them to be so abundant that fall, I did not discover.

Good Neighbors

To primitive man, most wild animals were good neighbors. The big meat-eaters were his direct competitors and often threatened his life and that of his children, but wild boars, deer, moose, elk, and wild cattle were all desirable neighbors.

I knew a gentle old trapper, who had a little garden patch near his log-and-bark cabin, who was a good neighbor to all his wild kindred, except the fur-bearers.

One day a big bull moose stepped out of a thicket and gazed with wonder at the trapper's garden patch. The old man looked kindly at the big beast and called in a friendly voice, "Don't you step on my potatoes!" and the moose went back into the woods. Unfortunately there are but few woodsmen and settlers who are such good neighbors to the wild animals around them.

It must be admitted that, to a farmer, deer and moose and other wild creatures would not always be desirable neighbors, because it takes an eight-foot fence to keep the deer out of a farmer's garden.

Moreover, we apply to all wild things a human standard of behavior, just as adults are apt to apply their own standards to children.

We are prompt to observe any injury that our small wild neighbors do, but we are too often unobservant of, or even blind to, the good they do. The farmer knows exactly the number of chickens and ducks a

skunk or a fox has stolen, but the number of gophers, mice, and other harmful creatures it has destroyed he cannot know.

Of all our small wild kindred, the gray squirrels are the best neighbors. They are so trusting and confident that all their interesting ways and doings may be easily observed. They will make themselves at home in any park, town, or suburb where there are trees and where houses are provided for them, and they are a source of enjoyment to young and old.



"Brer rabbit" *Courtesy of the American Museum of Natural History*

is also an interesting neighbor, but he does have

HE LIVES ON FRIENDLY TERMS WITH
HIS NEIGHBORS.

some exasperating habits. His choice of greens is apt to fall upon a man's favorite flowers, and he may girdle and kill valuable fruit trees in winter. A fruit grower can hardly be expected to love rabbits better than apples.

The gray squirrel, on the other hand, has no destructive habits. He lives on friendly terms with his bird neighbors, although he will not let a pair of noisy wood-

peckers live in his hollow tree because hollow trees are scarce.

He may take a few ears of corn, some fruit for the seeds, and some nuts, but he will gladly eat dry bread and cheap peanuts.

More about Gray Squirrels

The changing attitude of the public toward all forms of wild life is beginning to show in several ways. Years ago, when natural conditions were more favorable in suburban districts than they are now, a gray squirrel was a rare sight. If one did stray in, it soon found that men and boys were not good neighbors to the little wood folk.

Now the gray squirrels have invaded many towns. Most parks are full of them, and they have spread over the wooded suburbs. Near my home, they appeared about five years ago. One family of them has done something which gray squirrels do not usually do. Its members have ousted a family of red squirrels from an old hollow oak, of which the pugnacious reds have held undisputed possession for more than ten years. I did not see it happen, but it probably occurred some time during the summer; for when I returned to the city in August the grays were in and the reds were out.

At least one red squirrel is still in the neighborhood, and I have seen him chase the grays in the usual manner, but he does not try to regain possession of his family tree. I do not know why the grays always run

away from the smaller reds, unless it is due to the fact that the reds are more agile in the tree tops. In the close quarters of a hollow tree, however, Reddy is apparently afraid to fight his larger relative.

The common belief that the reds mutilate the grays is based on faulty observation.

The favorite food of my neighborly grays was dry bread, which they ate or carried away before they picked up the nuts I left for them. The members of another squirrel family preferred peanuts, and never touched bread as long as I provided them with nuts. Generally they looked for their breakfast at daybreak, and they were often active again just before dark in the evening. If they became alarmed at anything, they either froze to the tree trunk or made a run for home through the tree tops. They always took the tree route between their home and their feeding place, although the ground route was only half as long.

Both gray and red squirrels build many of the familiar leaf nests. Most of these, I think, are intended for temporary shelter and for daytime naps, but the grays, at least, also raise their young in them.

One spring, on April 10, on rapping a tree I saw a large gray squirrel come out rather reluctantly from a leaf nest, placed near the top of an oak tree. I climbed to the nest and found that it contained four young squirrels about ten days old. The upper parts of their bodies were covered with short gray hair, but their lower parts were still almost bare. Their eyes were just beginning to open. They were fat, chubby little fellows, and if it had not been for their thin tails, also

covered with short hair, one might have taken them for a litter of young bull pups.

While I took them down in my hat to photograph them, and while my companion returned them to the nest, they uttered squeals audible for about fifty yards, which closely resembled the cries of little blind pups.

I had some difficulty in finding the entrance to the nest, because it was closed by projecting leaves.

The weather had been rainy for nearly the whole of the previous day, but the roof of the nest had been so well built of leafy twigs that the inside, lined with some fine dry material, was perfectly dry and warm.

Late in summer some of my young friends made the discovery that the nest had been appropriated by a swarm of wasps, who were not as friendly to callers as the original owners.

The Walking Arsenal

There are two animals that do not try to escape from their enemies, the porcupine and the skunk.

Oga, as the Chippewas call the porcupine, is the fearless one of the forest. Only against a man with a club or other weapon is he helpless. He might hide, but fear, that great admonisher and preserver of the wild, has left Oga's heart, and his short legs are not suited to running.

Many an Indian hunter in bad luck, and many a hungry white timber cruiser whose work was too arduous for him to carry firearms, has saved himself from going hungry or even from starving to death by



SPINES AS SHARP AS NEEDLES OF STEEL.

living on roast porcupine until something better came within reach.

In the pine region around the Great Lakes, it has long been a tradition that no hunter may shoot a porcupine because that is the only game an unarmed man can kill with a stick. For that reason the porcupine was held sacred to the timber cruisers.

The punishment which a porcupine can inflict on an animal foolish enough or hungry enough to attack him is of the most terrible kind. The whole upper part of his body and his short, muscular tail are covered with spines as sharp as needles of steel. Each sharp point is set with hundreds of fine barbs, so that a spine once caught will never drop out, but will work deeper and deeper into the body of the enemy.

Oga cannot throw his spines, but they bristle in all

directions the moment he believes himself in danger of an attack and with his tail he deals quick blows. The spines are set very loosely in the animal's skin and they pull out the moment the point touches an enemy.

I once helped to play surgeon to a young bulldog who did not know the ways of the porcupine. He came to camp from a run in the woods frothing at the mouth and mad with pain. One side of his face looked as if he had grown a scrubby, gray beard about a month old.

We put him in a sack; two men held him, and a third man with a pair of dental pincers pulled out of his cheeks, his eyelids, his tongue, his foreleg and shoulder 108 porcupine quills by actual count. Without human assistance this dog must have perished. Some of the spines had penetrated the cheek muscles so deeply that it was easier to push them through than to pull them back against the barbs.

The porcupine eats the bark and twigs of many forest trees, but hemlock, jackpine, white pine, and common poplar seem to be its preferred diet. In mid-summer I have seen it walk out on a log and pull the leaves of the yellow water lily out of the water. I have also seen one feeding on tufts of succulent grass on the edge of a lake.

The creature wandered about until it came within five or six feet of where I was seated against a stump. Then a picture of the bulldog's face came vividly to my mind, and I spoke to Oga: "Don't you come any nearer."

The animal had not seen me until I spoke; it stopped and gazed stupidly at me with its small, black eyes. Then it turned in another direction. If Oga had not turned I should have left my seat without further argument.

Porcupines are at home in the forests from Nova Scotia, New York, and Labrador to Alaska. In the Adirondacks they are very common, and they have lately become numerous in the Itasca Forest in Minnesota. Near my camp on Sheep Mountain in the Bad Lands of South Dakota, they had killed or injured about half of a scattering growth of young yellow pine. I was much surprised to find porcupines there, but a rancher told me that they are found on all the wooded buttes of the region.

The Bush That Burns

Wahoo, the Indians called it, but a white pioneer, who had read in the Bible the story of Moses seeing a bush burning with fire without being consumed, called it burning bush, and no other name could be more fitting.

The small dark purple flowers appear in June. During June and July they wither and drop off; the seeds develop, and in August the fruit begins to turn red.

During autumn and early winter, after the foliage on trees and shrubs has begun to be thin or is cast off, the burning bush displays such charming beauty of scarlet and crimson, that one who suddenly comes upon a bush in full glow can hardly believe that anything of

such strange and exquisite beauty could exist in the woods.

It is the rich, velvety red of the hanging seed capsules, and the bright crimson of the seeds, which give to the burning bush its unique beauty. The capsules, about the size of burst popcorn, and shaped like little



A WHITE PIONEER CALLED IT BURNING BUSH.

four-cornered hats, are hung in masses from the spreading branches, making of each a flame of such wonderful red as one would never expect to find in the dull leafless woods. It is not the dauby, massed red of oak or maple in autumn. The two tints are put on accurately and evenly, as if a crew of elfin painters had wielded their tiny brushes. Each seed is coated with the spectrum red of the scarlet lobelia, or cardinal

flower, but for the pendent capsules, the elves mixed a special red with just a trace of purple. It is Nature's royal red, used on no other fruit, nor on any other bush or berry of North America.

Although the burning bush is native from the Atlantic to the Plains, it favors secluded woodland spots and is not found by those who see the outdoors only from an automobile.

Along the old Indian trails and the scouting trails of white boys it is not very rare, but it is never as common as the twining bittersweet.

The Indians knew it well. An old fur trader, to whom I showed a most glorious bush, knew it only by its Indian name "wahoo."

"The bark," he told me, "contains medicine."

The young shoots grow very straight, and the Indians used them for arrow shafts. They tied them in bundles and hung them up in their tepees to dry and season.

The wonderful mass of red on the burning bush is an advertisement to migrating birds to come and eat the scarlet fruit, and in return to scatter the seeds, that the wahoo may not die out in the forest.

Any man who wishes to plant hardy ornamental shrubs on his home grounds can find nothing more beautiful than the burning bush. Three species grow east of the Rocky Mountains, and an introduced European species has escaped from cultivation in New York and New Jersey.

As an interesting incident it may be mentioned that the wahoo was discovered and first described by the

botanist, Jacquin, in Vienna about 1770. Among many other plants imported from the New World, Jacquin found our largest and finest American burning bush. He called it *Euonymus atropurpureus*, which is its scientific name to this day.

There is something strange about this habitant of the forest. The young shoots are almost square in cross-section, and the dark purple of the small flowers approaches closely to black. The bush attains a height of from six to twenty feet, and seedling trees begin to display the scarlet fire, when they are about five years old.

When ordering wahoo plants from the nursery men, one should demand the American burning bush. The seeds of the European species are yellow, and give a less beautiful color effect.

Wild Hemp

Hemp and flax have been known and used as fiber plants for many centuries. The ancient Canaanites cultivated flax, and the Greeks raised it in the Homeric period.

Hemp seems to have come into use later and is not mentioned in the Bible or in Homer. It is a much larger and coarser plant than flax, and its coarse fiber is better adapted for the ropewalk than for the weaver's loom. It is a near relative to our stinging wood nettle, which also produces a very tough fiber.

Some of our cultivated plants have lost the ability to grow in competition with wild plants, just as some

of our domesticated animals have lost the ability to exist in the wild state. The hemp plant, however, is so strong and hardy that on favorable ground it not only holds its own, but is able to crowd out all native plants, even its robust weed competitors from the Old World.

A piece of drained muck land, looking to a casual observer like a common weed lot, which I have observed for more than a decade, produces year after year a rich crop of hemp. Nature evidently gets on very well here without any fertilizer or crop rotation. For years I expected the hemp crop to disappear or deteriorate, but every year a thick growth comes up, and the crop never fails. It is quite unusual, even among wild plants, to find the same crop covering the same ground for many years.

My explanation of the perpetual good hemp crop is



THE HEMP PLANT IS STRONG
AND HARDY.

this: The ground is never burnt over, and neither the stalks, leaves nor seeds are removed. The dead plants of one year literally return to the earth from which they grew and keep the soil rich.

Hemp is not a native plant in America. It is cultivated in some parts of the country, and has been spread in other regions with bird seed. It grows now abundantly on rich soil in waste places, and it may be found on open spots of suitable soil in woods near towns.

Many wild birds, especially the goldfinches, are very fond of hemp seed, and help to spread the plant. In fall the juncos, whitethroats, fox sparrows, and goldfinches may always be found in patches of wild hemp.

One who knows a little woodlore and woodcraft can quickly twist the fiber of hemp and nettle into very tough strings.

Keeping Peace with Sheegawk

If Sheegawk, the skunk, could put up a sign at the entrance of his burrow, it might read something like this: "If you wish to live at peace with me, don't get excited and don't get rough!"

Sheegawk will yield to persuasion, but not to violence, and he is much feared by all four-footed hunters.

One summer my partner and I camped in a forester's cabin, where Sheegawk had taken up his home under the floor. Sheegawk spends a good deal of his time at home, and he loves and appreciates a dry

roof over his head; but Nature has been quite niggardly in providing really dry homes for those of her children who cannot live in hollow trees.

Sheegawk's forefeet are well adapted to digging, but they are useless for climbing. Hollow logs, lying on the ground, are too scarce, and those which Sheegawk might find are generally too much exposed to the calls of annoying visitors.

Sheegawk is a philosopher who does not like inquisitive visitors, and he has found that a deserted shack, camp, or cabin makes an ideal home for him and his family.



SHEEGAWK IS A PHILOSOPHER.

He is not presumptuous enough to set up housekeeping within the four walls of a house. He modestly digs an entrance under the foundation and lives beneath the floor.

If he has a family under your floor, you may hear the little ones gently quarreling, but if he is a bachelor, you may never know that you have a near-by neighbor.

My partner called me one night to drive away a porcupine who was noisily trying to cut a hole through the cabin door, but she never heard or saw the coming and going of Sheegawk, who lived under the floor.

Neither did I see or hear him, but every morning

I found his tracks plain and fresh on the sand. Politely and diplomatically, but firmly, I invited him to leave.

He was a good neighbor, but I feared that an accidental meeting might frighten my partner, and that her fright might act unfavorably upon the nerves of Sheegawk, who has been known to mistake innocent people for dangerous enemies.

Every morning I closed his burrow, and every night he quietly opened it again, but I never saw him or heard him at work. Then I placed a board over the closed burrow, and he promptly extended his burrow under the board. Sheegawk has the reputation of being a little slow-witted, but at the end of a week or ten days, he caught the meaning of my invitation and moved to an unused barn a few rods away.

Here I saw him one afternoon, a large corpulent bachelor, leisurely starting on his daily foraging trip, and then I told my partner that Sheegawk, our nearby neighbor, had moved.

Thus I kept the peace with Sheegawk, the much-feared, although we were next-door neighbors for six weeks.

The Soil Underfoot

The human mind learns most easily by comparison; isolated, unrelated facts are dead and without meaning. Really to appreciate the bountiful fertility of the soil in the Mississippi valley, one must walk and climb over the stony slopes and the rocky hills of New

England, the Hudson Highlands, and northern and western Ontario.

The soil in the northern states of the basin of our greatest river as far south as Cincinnati and St. Louis was mixed, ground, and pulverized in the mill of the continental glacier.

The network of roads which is now being built over the whole country opens thousands of pages of the story of the soil.

Generally speaking, there is exposed to plain view a jumble of clay, sand, and gravel to within a foot or two of the surface. Above this unstratified material lies about a foot of yellowish or reddish fine soil, and above this lies about a foot of black loam in which the roots of wild grasses and flowers and the crops of the farmers find their sustenance. Below this layer of humus, and below the yellow or red subsoil and the jumbled unstratified material lies the native rock of limestone, sandstone, shale, granite, or some other rock.

All the loose soil above the native rock has been mixed, transported, and finally dropped by the great continental glacier, as it slowly crept over a large part of the continent in a general north to south direction and at last melted away.

In the process of soil distribution the glacier has robbed one part of the continent to give to another. It has practically swept bare of soil the hills of New England, the Hudson Highlands, and vast areas north of Lake Superior and Lake Huron, and it has deposited bowlders large and small, pebbles, gravel, and

clay from Minnesota and New England to the latitude of Cincinnati and St. Louis.

In some regions, especially in New England and parts of New York, it has strewn the slopes and valleys with boulders so numerous that the settlers had to clear the land of boulders after they had cleared it of the primitive forests, so that these regions to this day show more miles of stone fence than miles of road and railroads.

Scattered boulders are common enough in Minnesota, Iowa, Ohio, and Indiana, but they are seldom found in such abundance as on the home farm of John Burroughs at Roxbury, New York.

Some of these glacial boulders, which may have been transported hundreds of miles, are of immense size. Three big ones, known as the Three Maidens, lie near the song-famed pipestone quarry at Pipestone, Minnesota. Some of their rough corners have been polished by buffaloes rubbing against them.

The largest one I have seen in the Northwest is the size of a haystack, and from a distance looks exactly like a big oblong haystack.

Winter Berries for Birds

Birds act like improvident children when berries ripen. Unless the supply of their favorite fruit is entirely beyond their capacity to consume, they do not leave one berry on the bush for winter and for the lean season of early spring.

In the fall of 1922 the mountain ash trees near my

home bore a good crop of rich orange berries, but the robins flocked to these trees as if they were under contract to pick the fruit and had given their word to make a clean job of it. I thought at first that they were going to leave the fruit on one of the trees for



THE MOUNTAIN ASH BORE RICH ORANGE BERRIES.

the straggling winter flocks of cedar birds, as I have known them to do, but I was mistaken. The last two days of September an extra force of red-breasted berry pickers appeared, and when the sun set on the last of the month, there was not one orange berry left either on the trees or on the ground.

A few straggling birds, coming several days later,

sampled the black fruit of the buckthorn hedges, but evidently buckthorn berries do not appeal to birds in autumn.

It may be stated as an axiom that every small wild



A CURIOUS, BEAUTIFUL TWINING VINE, THE MOONSEED.

fruit or berry, be its color white or black, red or blue, and be its taste ever so insipid or disagreeable to the human palate, is eaten by birds. The only fruit I have never seen or known any bird to eat is that of

the jack-in-the-pulpit, but I have no doubt that even these bad medicine berries are eaten by some bird or animal.

There is a curious, beautiful twining vine, the moon-seed, growing in woods from the Atlantic coast to the plains, which bears dense bunches of berries that look much like wild grapes. They are juicy and look inviting and their taste is not bad; but the migrating robins, thrushes, and catbirds never touch them in fall. All winter the berries hang from the pretty twining vines, and the tough skin keeps the crescent-shaped seed in a permanent bath of black juice. Not until the spring migrants return do these tempting black bunches disappear.

I cannot help thinking that with some winter berries Nature is guilty of fraud and imposition practiced on the winter birds and on hungry spring migrants just returning from a far country.

The aromatic cedar berries do contain a little pulp and juice for cardinals and waxwings. The showy seeds of bittersweet and burning bush are at least wrapped up in a thin edible coating to tempt grouse and belated robins; but what nourishment can there be in the dry shriveled fruit of the sumacs, the hackberry, and the poison ivy? It may not be exactly a case of offering to the hungry songsters stones instead of fruit, but it certainly does seem as if the birds were fooled into eating pellets of wood disguised as berries.

That the migrating hosts of thrushes, robins, white-throats, juncos and warblers at this time are often hard pressed for food is well known. If, as occasion-

ally happens, a late frost or snowstorm overtakes the migrants, thousands of them face actual starvation. At such times they will anxiously search every foot of bare ground near buildings, and will gather in flocks to pick up a few worms and larvae on ground cleared of snow and dug up.

Esseepan, the Coon

Brer Coon is one of our four-footed kindred who has appealed to the poetic fancy of the negroes and whose fame has been told by Uncle Remus.

Indeed, any one who has not lost all sympathy with the humble folk in fur and feathers, cannot help feeling some admiration for Brer Coon for the way he has fought and held his own in the battle for existence.

Before the World War some 380,000 coon skins reached the fur trade annually, which means the killing of at least 400,000 raccoons each year.

During the three years of fabulously high prices of fur immediately following the World War, the number of coon skins handled by the American fur trade reached the immense total of 1,713,700 for the years 1919 to 1921, an annual catch of 571,233. The total number of coons killed during these years of destruction must have come close to 600,000 a year.

An animal that can keep its hold on life in the face of such destruction deserves our admiration and protection.

The time is here when all our fur-bearers must be given rational protection, or the American fur trade

will destroy itself. It should be illegal to cut down a tree in order to catch a family of coons, and it should be illegal to drive them out by the use of fire. Hollow trees, the natural shelter for many forms of wild life, are getting scarce enough without intentional ruthless destruction.

Fortunately the coon will make use of other shelter, if the hollow tree of his ancestors cannot be found. He will accept a hollow log lying on the ground, or a crevice in a rocky cliff, in fact any kind of shelter where he can sleep through the very cold weeks of winter. Thompson Seton thinks the raccoon will not use a hole in the ground.

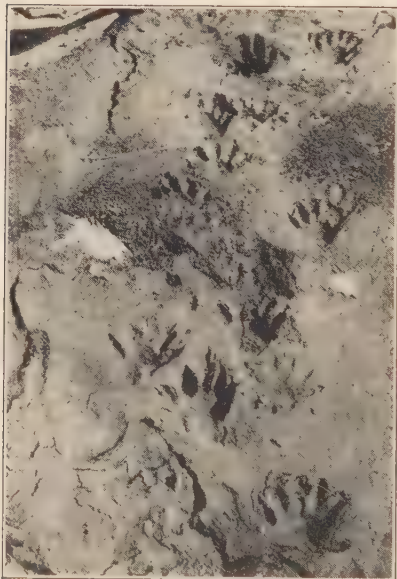
The coon's favorite summer food is corn in the milk, and the species is moving northward with the spread of settlements into the northern pine regions. Ten years ago coons were not known at the headwaters of the Mississippi, but in the spring of 1921 a pair of them was found asleep in the hay in the manger of an unused barn at the forester's cabin of De Soto Lake.

It is surprising how little is known of the life history of these common animals. According to Seton, it is not known when they mate, nor whether the parents ever carry food to the young. It is probable that a pair remains mated for life, but we have no absolute knowledge on this point.

In German the coon is called *Waschbaer* in reference to his curious fixed habit of dipping his food in water before eating it. The coon gathers much of his food in shallow water—frogs, crayfish, stranded fish,

and probably clams. Very likely he acquired the habit of rinsing the mud and sand off his aquatic prey before he ate it. This habit has become so fixed that a captive coon will dip a piece of meat, whether the meat needs washing or not.

Esseepan, as the Chippewa Indians call him, is not



HIS TRACKS MAY BE FOUND IN
THE MUD.

a profound winter sleeper. In the south he is active all winter, and in this latitude his tracks may be found on the snow in March, or in the mud along river banks and lake shores long before the ice has melted on the lakes.

The animals are naturally nocturnal, and are seldom seen in the daytime, and this habit has undoubtedly contributed to the preservation of the species.

Coons are still found over the larger part of the United States and Mexico, but they are dwellers of the forest and cannot live where there are no trees.

Hobcusha, the Woodchuck

We cannot help feeling a kind of affection for an animal that has lived in such close contact with the early settlers that he has given rise to our best known animal legend.

The heavy-set groundhog, or woodchuck, appealed to the pioneers, I suppose, because he possesses some of their own rugged traits of character. He held his own against Indian hunters and Indian boys, and he did not think of leaving when the whites took possession of the land. In fact, he quickly learned to make use of their clearings, stone piles, and stone fences, and he holds his own everywhere to this day.

I have found his holes in open fields; I have seen him look contentedly out of his burrow in the rocks of a railroad cut, as if he were a venerable old pensioner, who enjoyed seeing the trains go by.

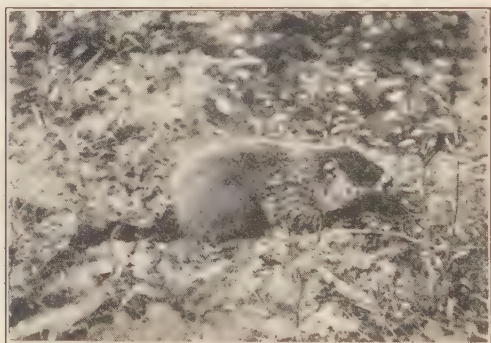
On one occasion I surprised one in an open field. He rose up and looked at me, as if to make up his mind whether I was a friend or an enemy. After a few minutes of hesitation, he came toward me. I was surprised at his boldness until he vanished into his den, which was located between me and his first position.

Hobcusha, as the Sioux Indians call him, is not a great runner and traveler. He has faith in his dugout, and does not range far from it.

He fights hard, if he has to, but, if it is possible, he makes a rush for his hole; and, so far as I have observed, no enemy dares to follow him underground.

A fox does not enter a hole, unless he is very hard pressed by the dogs. The woodchuck makes for his den at the first sign of danger; he sleeps there at night, and he spends the long winter in its safe retreat. Here he does not have to worry about his daily bread, and he does not have to fear hungry foxes and wolves.

The question whether a woodchuck can climb trees has been much debated; he can and often does. Like



A YOUNG WOODCHUCK AWAY FROM
HIS HOLE.

humans, he is more inclined to climb trees while he is still a boy, than when he is grown up.

Once I saw a young woodchuck scramble up a wild plum tree within a few feet of me, and from his elevated position he looked at me so intently that I think his action was impelled by curiosity. When I touched him with a stick, he hurriedly scrambled down to the ground and ran away into the brush.

On another occasion, I surprised a young woodchuck away from his hole. I think he had been asleep in

the sun. He climbed up about twelve feet in a small sapling, just big enough to support him. I did not disturb him, but hid behind some bushes about a hundred feet away to see what he would do.

Time was, apparently, not very valuable to him, but neither was it to me, for I was living in camp on my summer vacation. He clung to a small branch for twenty minutes. At the end of that time he turned, and with great deliberation, and it seemed to me with considerable effort, he descended head downward. As soon as he had reached the ground, he ran off into the brush.

The Age and Growth of Trees

Some trees grow very much faster than others. Oaks are comparatively slow growers, but willows and cottonwoods grow very fast.

A stand of peach-leaved willows and cottonwoods, which I observed some years ago on favorable soil, attained a height of eighteen feet and three inches in three seasons, starting not from shoots or cuttings, but from seeds.

On the upper Mississippi, between the Iowa line and the Twin Cities, and on the Minnesota River, the cottonwood is the fastest growing tree. It grows best on rich soil in the river bottoms, where the land is subject to overflow and is, for that reason, not well suited to farming. Such lands might be converted into profitable cottonwood forests, which will produce saw logs in twenty years.

Elm, soft maple, and white ash also grow very fast on low river-bottom lands. Sugar maples, hickory, black walnut, butternut, and basswood, or linden are also reasonably fast growers, but they demand fairly good and well-drained soil and will not stand flooding.

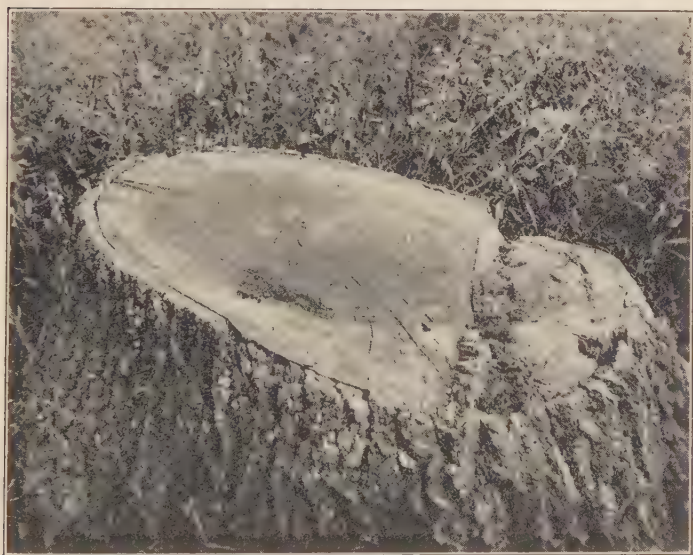
Black spruce and tamaracks are generally crowded by the competition of other trees into poorly drained swamps, where their growth is slow. Most of the paper now used for books and newspapers is made of black spruce pulp. The average black spruce tree is forty years old, when it is big enough for pulp wood, and it may be ten inches in diameter three feet above the butt, when it is sixty years old.

Some trees do not reach great age, but others, it seems, would live and grow forever if storms and lightning did not fell them to the ground. The normal age of the aspen is about half a century. Willows and box elders are also short-lived trees. White and Norway pines may be sound and growing at two hundred years of age, and white and bur oak live for three hundred years and over.

The age of trees can be quite accurately determined by the rings of the log and the stump. Each season's growth makes one ring.

The oldest and largest trees in North America are the giant sequoias of California. They grow to be over three hundred feet in height, and some of them, according to John Muir, reach the age of 5,000 years. This means that they were already bigger trees than most of us have ever seen when Christ preached the

Sermon on the Mount. They were 1,000 years old and were probably bigger than any tree now to be found east of the Rocky Mountains when Abraham was living on the plains of Mamre. The sequoias are practically insect and fungus proof. Forest fires,



EACH SEASON'S GROWTH MAKES ONE RING.

severe storms and lightning are the only hostile forces which may end the life of the California giants.

Among the most majestic trees in Eastern North America are the sycamore and the white elm. Dr. Walker, one of the early explorers of the mountain country of Kentucky, found an elm that measured forty-five feet around the widest part of the trunk, which means that it was about fourteen feet thick.

How Nature Trims Forest Trees

As one views a grove of old pines that rise with branchless trunks fifty to sixty feet high, one cannot help asking how these old trees were trimmed of the branches they must have had in youth.

One finds tall pines and spruces of northern forests trimmed in this way, but in forests to the south oaks and beeches, elms and hickory, walnut and tulip trees appear trimmed in the same way to a height of sixty feet or more.

In the close northern stands of pine and spruce nature's process of trimming trees is most easily observed. It is quite clear that in these places a thousand young trees may have started on an acre of ground. There was keen competition for light and space, in which only the more vigorous trees survived, while the weaker ones were suppressed by being shaded out of existence.

In such a grove one finds a number of vigorously growing trees all of about the same height and diameter. These the forester calls *dominant* trees. Smaller and thinner trees, which are completely shaded, are doomed to die after a lingering struggle for a few stray beams of sunlight. These the forester knows as *suppressed* trees.

How do the dominant trees rid themselves of their lower branches to produce a straight trunk of valuable timber?

All the lower branches produced in youth die in



THE LOWER BRANCHES DIE FOR WANT OF LIGHT.

time for want of light. They decay near the trunk, where they retain some moisture, and after one or more years, they drop off by their own weight. The process is helped along by ice and snow, which lodge on the dead branches.

Some trees are more easily trimmed than others.

This is especially true of white and Norway pines which for that reason make the clearest lumber without knots. The jackpines hold dead branches more tenaciously, and for that reason make lower grade, more knotty lumber, unless they grow in a very dense stand.

One sometimes finds tall old trees, with branchless trunks far overtopping a young growth around them. The shape of these trees is explained by the fact that in their youth they were crowded skyward by the trees growing near them, either of their own or of other species.

Nature does not trim trees which grow in the open. Such trees send out long branches in all directions. They attain no great height, but may spread their branches over a circle sixty feet in diameter.

The white oak, if growing in the open, will show a most magnificent spread of large boughs. The common elm will develop a characteristic fan-shape growth of branches, while sugar maple, basswood, bur oak, hackberry, and cottonwood will make fine, round-topped shade trees.

The evergreens, when young, are all cone- or spire-shaped. The pines and hemlocks lose this shape in old age, but spruces, firs, tamaracks, and cedars retain some of their youthful form throughout their life.

Ornamental Native Vines

The real world of twining and climbing vines is in the tropics, but quite a number of ornamental vines, such as wild grapes, woodbine, bittersweet, clematis,

and moonseed grow almost everywhere in our northern woodlands.

There are no native wild grapes in Northern Europe. This fact led the old Norse explorers to give the name of Vinland to some part of the coast of New England.

One of our most interesting native vines is the bitter-sweet, which often climbs to the tops of forest trees by twining around the supporting trunks and branches.

Each kind of twiner has its own way of reaching the light. Bittersweet and wild beans always twine counter-clockwise, and no effort can make them go clockwise.

Grapevines and woodbines do not twine, but climb by means of tendrils resembling the method of sweet peas.

There is hardly a more beautiful sight in the winter woods than a tree or bush covered with bittersweet, displaying hundreds of clusters of bright orange berries, which remain on the vines and retain their bright color all winter.

To the hungry grouse, who cannot get at anything green and are compelled to live on buds and hazel catkins, the waxy covering of the bittersweet seeds is a welcome dessert.

But to the tree that supports it *Celastrus*, the scientific name for this vine, is not a welcome or beneficial guest. The twiner is not a parasite; it does not draw food from its host, but its coils become so tight and so strong that the guest sometimes kills its host by strangulation.

I have often wondered how *Celastrus* protects itself

against wild mice and rabbits. Its thick, pulpy bark tastes slightly sweet and was, at times, used as food by the Indians. The woodfolk, however, do not relish it, or they would not allow the winding coils to reach the thickness of a man's wrist in localities where wild mice and rabbits are numerous.

The moonseed, on the other hand, is rarely allowed to attain the thickness of a man's finger. Almost every season the vines are cut off near the ground, compelling the plant to produce a strand of young twisted vines nearly every spring.

Both bittersweet and moonseed are very desirable ornamental vines, but they must be tied up or furnished with some support so they may climb in their own way. In transplanting bittersweet and moonseed, one should make sure to take plants of both sexes, because some of the plants produce male flowers and others female flowers only. Unless both kinds are planted close to each other, so that wind or insects can transfer the pollen, one will look in vain for the ornamental berries.

Both bittersweet and moonseed are thoroughly acclimatized to our northern winters and need no protection.

Part II
WINTER

Waifs of the Woodland

As I walked down the trail to my winter cabin one December afternoon, I caught the faint mouse-like call of the little brown creeper. It is one of the faintest woodland sounds, and even an experienced woodsman sometimes finds it difficult to locate the bird after he has heard the note.

It is just a low "zeep, zeep," which seems to come from nowhere in particular, and if it were not generally followed by a louder and more sustained note, even an experienced observer often would fail to locate the plain little creeper of the tree trunks.

Whether one bird works by himself or there are two or three together, the low "zeep, zeep" is uttered three or four times a minute.

All woodland winter birds, the nuthatches, the woodpeckers, and chickadees, are persistently in search of food through the short winter days. Only the chickadees, who wander about in merry flocks of half a dozen or more, seem to have time for playing and quarreling and a great deal of chirping and twittering, which sounds like brief snatches of song.

But all of them show that they are aware of the presence of an observer, except the brown creeper, whose slender shape and color blend so accurately with the neutral color and the ridges and furrows of the bark that he becomes almost invisible.

If one does discover him, he is so entirely preoc-



Courtesy of the New York Zoölogical Society, New York City

THE LITTLE BROWN CREEPER.

cupied with his search for hidden insects and insect eggs that he does not seem to notice any one watching him. He generally begins his inspection of a tree near the ground and then runs in spirals to the upper branches, but never works head down as the nuthatch often does.

Woodpeckers and nuthatches sometimes do locate a good fat grub, which even a human could find. I have seen the downy bore into a large cocoon, which it took him twenty minutes to empty for his Christmas dinner, but there are no such lucky finds for the creeper. His long awl-shaped bill is designed only to pick up and probe for the tiniest of morsels.

One winter season a creeper came to my food store

quite regularly, but he picked up only the small crumbs of suet that had dropped to the ground. The big white pieces in plain sight on the tree trunk he seemed unable to handle; he left them for the nuthatches and blue jays to carry off. He had no way of storing food for a stormy day.

Let me return to the creepers that I discovered near my camp late on a winter afternoon. "Where do those midgets sleep during those long winter nights?" I asked myself as I had asked many times before. Just at dusk that evening I recognized the long low "zeep" in the elm above my cabin. I stepped outdoors and again heard the call but could not find the bird.

The next evening I was on watch just as the sun was dropping behind the trees of the lake shore. Soon the familiar notes came from the elm, but I knew that the little creepers could not spend the night on that wind-swept tree. I kept my eyes on an old willow, full of crevices and woodpecker holes.

Suddenly a little brown bird appeared and, running up the trunk like a wood mouse, vanished into a crevice. Within a few seconds another and a third came and vanished into the same crevice. They were all gone in less than a minute.

A storm is roaring through the tree tops as I am writing these lines, and I am happier for knowing that the little waifs of the woodland are not in the storm. I fancy that they are nestled close together, like children in bed, and I hope that the storm will not blow down their woodland shelter.

Frogs in Winter

One who can find a frog in midwinter has learned something of the ways of nature.

When lakes and ponds are covered with two feet of ice and the frost is creeping deeper and deeper into the ground, it seems a miracle that one of such creatures as frogs, toads, salamanders, and the noisy little tree frogs of summer should survive.

Frogs and their relatives possess no such internal heating system as the warm-blooded birds and mammals. The body temperature of birds and mammals is kept at the same height winter and summer, but frogs and toads cannot raise their body temperature above that of the air or water in which they live.

Birds and mammals are in addition protected against the cold by thick coverings of feathers or fur; the humble batrachians have nothing but their bare skins in which to clothe themselves.

I think it was John Burroughs who called frogs the real old fogies of the animal world, because they never play. We should, however, not rate their intelligence too low on this account. To a frog, life is a serious business, because surrounded as he is by a veritable host of enemies, he has only his protective color and his ability to hop and to hide, to maintain his hold on life.

When winter approaches, the great majority of frogs seek a safe place to hibernate in lakes, ponds, and springs. On mild October days they may be found in

large numbers in the weeds along shore, where they are enjoying the last warm days of the season and catching the last stray insects. They seem to be loath to go into permanent winter quarters, just as active children dislike to go to bed.



THE FROG (RIGHT) AND HIS RELATIVE, THE
TOAD (LEFT).

Some weeks later, when ice begins to form along the shores, quite a few may still be found under weeds, leaves, and rubbish near shore, as if expecting a few more warm days. If such warm days occur, many sluggish greencoats come out again and squat stupidly along the shore. On one occasion I noticed that they experienced a peculiar difficulty which they seemed unable to solve. A thin coating of clear ice, which had

covered a pond, had melted again near shore, and many frogs had come out as if to take a last look at the world of sunshine. As I walked along the sand, they hopped, somewhat benumbed, for deep water. Instead of plunging into the water in safety, they landed on the clear ice, where they slid around awkwardly as if they were attempting to skate. In a short time they became so chilled that they were quite helpless. A family of minks had made their home in this pond, and I fancy that those autumn days furnished them some rich meals at the cost of very little work.

Some species of frogs hibernate on land. On a walk early in spring, before the frost was out of the ground, I heard the call of a small frog, known as peeper. After a careful search I discovered half a dozen of them in the soft, thawed soil which covered the entrance to the burrow of some small animal. Whether they had spent the winter where I found them, or had just come up from a greater depth in the burrow below, I was not able to determine.

One must be a fairly good naturalist to find any frogs in midwinter. A few of them may always be discovered in springs and open water holes, but the great host of the merry croakers of spring are now safely squatting in the mud under stones, weeds, and rubbish, below the reach of the frost.

Social Wasps in Winter

Every one has seen in late summer or in fall the large gray paper nests of the insects popularly known as wasps, yellow-jackets, and hornets. All of them are peaceful folk, who mind their own business, if they are not interfered with, but who are thoroughly prepared for war.

During the summer season neither man, beast, nor bird will rashly disturb the colony of hard-working wasps in their paper bags or open combs, hung on trees, under eaves, or in holes in the ground, but after a few days of sharp, cold weather, it is quite safe to approach the strongholds of the armed insects. Many people think that, like the honeybees, all social bees and wasps live in their nests the year round, but that is a mistake.

The largest of these gray paper nests are built by the bald-faced hornets. One of their nests is about the size of a boy's head, and may be inhabited by two to four hundred hornets. But this number is only an estimate. I do not know of any one who has ever counted a colony of paper-makers or who knows how many of them a nest will hold.

The nest consists of three or four combs with cells opening downward, surrounded by half a dozen layers of gray blotting paper. These the owners have made with labor and patience by chewing up into a pulp old wood fiber scraped off boards, trees, or posts. The

combs are used only for rearing the brood and never contain honey.

One would think that a home or nest built with so much labor would be occupied season after season for an indefinite time. It is used, however, only during one summer, and after that one season it is abandoned.



LARGE GRAY PAPER NESTS.

When the nights get frosty and the workers can no longer catch flies for the brood in the nest or gather pollen and nectar from flowers, they all die. The brood left in the nest at this time also dies. By the middle of November at the latest, there is not a living thing left in any of the nests, and it is

quite safe to take them down and study them at leisure.

The fertilized queens are the only individuals that survive, but they do not winter in the nest. They hide under leaves and forest litter and pass the winter in a dormant state. Twice I have found dormant

queens. They could neither fly nor walk, but I handled them with care, for they had life enough to show their formidable stings.

When the spring flowers awaken from their sleep, all the dormant wasps and hornets come out of their hiding places, and the game starts all over again. But no queen hornet ever enters an old nest, no matter how well preserved and inviting it may hang from a leafless branch.

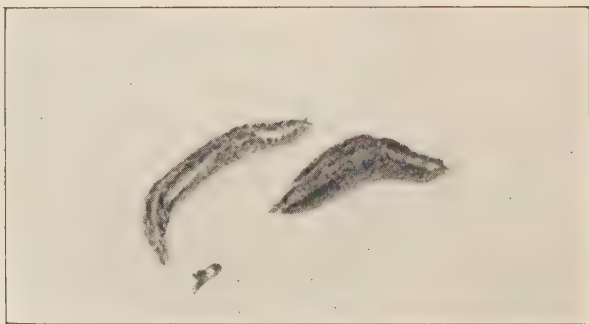
I agree with the late naturalist-philosopher of the Hudson that the game of life in itself is worth all the trouble and pain it takes to play it. And bird and beast, butterfly and bee certainly all enjoy and have a right to enjoy the simple but marvelous lives that have been allotted to them.

A Mysterious Immigrant

It is not surprising that birds and some animals are widely distributed over the earth. Even such small birds as the warblers fly straight across the Gulf of Mexico, while the larger animals can travel from five to twenty miles a day.

The distribution of some smaller creatures is not so easily understood. None of the members of the large group of mollusks ever violated a speed law. Their means of locomotion is foolproof; they never exceed the proverbial snail pace. In spite of this limitation they are well distributed over the whole earth. Most of them live in the water, but many have found a safe niche on land.

The land mollusks, known as snails and slugs, prefer a moist climate. Like the angleworm, they cannot travel over a dusty road or even cross a narrow strip of dust. The creatures are generally nocturnal, and on summer mornings one may find their glistening trails on the cement sidewalks. Sometimes a small slug is found exhausted or dead at the end of the trail, but more commonly it has safely returned to its hid-



THE SPOTTED SLUG IS A COMMON GARDEN PEST.

ing place under boards, stones, rubbish, or grass and leaves.

One of the most widely distributed mollusks is the spotted garden slug. It is found in such widely separated places as England and Asia Minor, the Azores and New Zealand, and the islands of the Mediterranean. On our own Atlantic and Pacific coasts it is a well-known garden and greenhouse pest. In the drier regions of the interior it is not so common.

Slugs eat almost any kind of tender vegetation and many kinds of root crops, such as white and sweet potatoes.

While they cannot travel great distances under their own power, they are accidentally distributed by man in shipments of nursery stock, roots, bulbs, and flowers. In this way several European species, like the spotted slug, are becoming as common as rats, mice, and house sparrows.

The spotted garden slug has been known in New England for about fifty years. It is common in the Hudson Valley, a hundred miles north of New York City. During the day none can be seen, but in the evening, especially after a rain, they come out from under the hedges and feed on dandelion leaves near the sidewalks.

They are very fond of mushrooms, and if they once find entry to a mushroom cave they are likely to become a great pest. The spotted garden slug commonly reaches a length of four inches; many slugs measure less than two inches.

Brer Rabbit

All the noble big game species of America maintain only a precarious hold on life by the aid of game laws and refuges, but Brer Rabbit and Molly Cottontail, his mate, still raise their numerous offspring in every township and may be found within the limits of almost every city, from Ontario to Louisiana and from the Atlantic coast to the patches of timber in the Dakotas.

In the good old days of wooden sidewalks, rabbits were about as numerous in towns as in the country. Even now they thrive in wood yards, lumber yards, and

in the suburban districts wherever they can find the shelter of a hedge or brushpile.

I thought there were no rabbits near my home last winter, but on the morning after the first snowfall, I found plenty of rabbit tracks all over my yard.

Every night bunny forages somewhere in the neighborhood but he does not visit every place every night. He is even somewhat fastidious about his food. Cabbages and carrots do not appeal to him as a winter diet; he prefers a substantial crust of bread. But sometimes my neighbor's dog gets ahead of him, and then Brer Rabbit has to fall back, I fancy, on a diet of sumac bark, hazel and other brush.

Occasionally a rabbit proves a troublesome neighbor. Last summer one of them took a fancy to my neighbor's sweet peas, not for the flowers but for the food value of the plants. When food is plentiful, Brer Rabbit is a dainty feeder. The woods may be green and the grass and weeds may be thriving, but he will go poaching on flower beds and garden patches, and nothing but a high, netted wire fence will keep him from indulging his refined appetite.

Once I succeeded in taming a wild rabbit. As a small bunny, he came one spring evening to make his supper of the juicy young grass of my lawn, and the children caught him and put him in a box. Next morning, as I had expected, he was gone.

But a few days later he came again, and now the children did not try to catch him, but taught him to eat bread. Apparently he appreciated a varied diet, and soon became tame enough to take the bread out



THEY TAUGHT HIM TO EAT BREAD.

of their hands. Every evening he appeared on the lawn, and I discovered that during the day he slept under my porch, where dogs and cats could not follow him.

Once he nearly lost his life, when a stray cat sprang upon him, but he was quite a big bunny by that time and he recovered from his wounds.

While the family was away during the summer he disappeared, but I fancied that he was the rabbit who, in the fall, led my beagle many a fruitless chase on the adjoining woodlots.

A Deer Census

Of all American big game, the white-tail deer, or Virginia deer of the Eastern states, is the only large animal which thrives and endures near civilization, if given reasonable protection. In fact, deer thrive better near clearings and scattered settlements, than they do in a country entirely wild, because there they find much more food than they do in a region of primitive forests, and there, too, they suffer less from wolves.

In the northern parts of Minnesota, Wisconsin, and Michigan, and in the Province of Ontario, hunters, settlers, and Indians kill about 68,000 deer annually. These figures are based on official reports from Minnesota, Wisconsin, and Michigan and are more likely to be too low than too high. The number of deer in Ontario is estimated to equal the number in any one of the three states.

To this number must be added at least 15,000 killed by various wild animals, wolves, coyotes, and lynxes, which makes a grand total of 83,000. Judge Shiras found 325 deer killed by wolves in one county in Michigan during one winter.

The deer in the states named seem to be about holding their own, although I think the killing has reached a danger line. I doubt that the species can stand more than a 25 per cent annual kill of the total stock. If that estimate is nearly correct, the total deer population of the region named should be 252,000.



Courtesy of the New York Zoological Society, New York City

VIRGINIA DEER, THE ONLY LARGE WILD ANIMAL THAT THRIVES NEAR CIVILIZATION.

Undoubtedly there are more deer in this region now than there were before the lumbermen and forest fires invaded the country.

I have no recent figures available for New York, New England, the southern and western states, but I think that 100,000 deer outside of the Great Lakes region is a liberal estimate. This would bring the total white-tail population of North America up to 352,000. These figures look quite respectable, but they indicate only a remnant, possibly $1\frac{1}{2}$ per cent of the original number.

With rigid protection we should, however, have plenty of deer in their present range for another fifty years. We shall have to give effect to our game laws, to establish and patrol game refuges and breeding grounds with a thoroughness which sportsmen in this country have never known.

Good roads and the automobile leave no natural refuges. The whole big game range of the continent is getting to be easily accessible. Guns are becoming more deadly, and the number of hunters increases every year.

The range of the white-tail originally extended practically over the wooded region of the United States east of the Rockies and even into the mountains. Deer have, of course, disappeared from all densely settled regions, but have extended their range much farther north.

In the days before the white man, this deer was one of the main food supplies of the Indians east of the buffalo country, and it was very numerous in all suit-

able localities. Thompson Seton estimates that the white-tail deer population of that time was 20,000,000. Just before white settlers flocked into Minnesota, a camp of Sioux within twenty miles of St. Paul brought to the traders 1,800 deerskins in one season. The present number of white-tail deer, as already stated, is probably 352,000.

The scattered Indian tribes with their primitive weapons made no impression on this noble game, but, at the present time, we kill probably close to 100,000 annually of those left.

How long will the noble game endure this drain? It is a serious question for all real sportsmen and lovers of nature.

One of the worst defects of the game laws of many states is their neglect to compel statistical returns from the hunters and trappers of all animals killed or trapped. In the absence of reliable figures, all measures of game protection are more or less based on guesswork, and it is a notorious fact that most hunters and woodsmen grossly overestimate the number of game animals or birds found in a given region. Too often game is reported and believed to be plentiful until the last bird or the last animal has been killed. The whole country is badly in need of a game census.

I have no quarrel with real sportsmen. If it were not for their active interest, our stock of game animals and birds would be more depleted than it is now. But I should prefer to train our boys to hunt with their eyes and their cameras rather than with guns.

It is excellent sport because a good shot with a camera is much harder to get than with a rifle.

The game one shoots with a camera does not bleed and suffer; it never spoils; the pictures become more valuable with age; and there is no closed season for the camera.

Reynard, the Fox

It was not necessary for the modern nature-fakers to invent incredible tales of the intelligence of Reynard. The Greeks paid tribute to him in Æsop's Fables, and the literature of all modern nations contains many stories and fairy tales of his remarkable sagacity.

A young friend of mine who is something of a trapper and hunter once had an experience with a fox, which shows that Reynard knows how to take care of himself. My friend saw a fox in the open and chased him into a patch of tall weeds and grass about two acres in extent. He tried for an hour to make the animal break from his shelter, but could not do so. From time to time he observed a slight movement in the grass, but not a red hair was ever visible, and the hunter finally left the fox safe in possession of his skin and his weed patch.

Near the same place, I once discovered a freshly excavated den. From four to five bushels of loose, yellow sand had been dug out of the hillside, and Reynard's footprints were plainly visible on the moist earth. It was early in spring, and no doubt the den

was intended for a brood of young. I was careful not to disturb the mound of sand or the den. But in taking several photographs I could not avoid walking about near the hole, and the foxes promptly abandoned it and did not go near it, as far as I could tell, for about



I ONCE DISCOVERED A FRESHLY EXCAVATED DEN.

two years, when they re-excavated it for an occasional winter refuge.

I asked a nearby farmer if the foxes ever stole any of his chickens, and he replied that they never bothered him.

Contrary to popular opinion, an adult fox does not sleep in his den. He knows all the sheltered spots and sunny ledges on his hunting circuit of ten to twelve miles, and in these places he coils up and sleeps when he is not hunting.

Some farmer friends of mine, while planting corn, saw a fox at some distance in the open field. The animal was jumping about as if in play, and the men could not tell whether they saw one or two animals.

They went home after spades and shovels and also brought Frank, the farm dog, who was a doughty warrior against snakes and skunks and woodchucks, against stray cats and strange dogs. As they passed the hole in the flat, open field, one of the parent foxes bolted from the hole and escaped.

They found six little blind pups on a bed of dry grass and straw about twelve feet from the entrance. Old Frank, who was to be the executioner, could not be made to touch them. His instinct of dog chivalry rebelled against harming any helpless young of his own kindred.

In a side tunnel, the mother had stored food, as if she had been preparing for a siege. There was one very small suckling pig, about twenty meadow larks, forty striped gophers, and one domestic duck. Some of the meadow larks and gophers were very ripe, but the duck was still warm.

In this case the parents showed a lack of their usual intelligence in the placing of their den, and one of the parents plainly gave away the location of the den. Perhaps they were young animals raising their first brood.

It seems that the killing of forty injurious gophers would fully pay for the birds and the little pig they had taken. In this respect Reynard's real life is not as black as his popular reputation.

About Muskrats

Musquash, the little brother of the beaver, suffered more than any other animal from the high price of furs which came after the World War.

It was not many years ago that every slough and marsh was filled with the domes of muskrat houses, and farmer boys and Indian lads felt rich if they could sell a few dozen skins at fifteen cents a piece.

Those were happy days for the little marsh beavers. Then came the World War, and the price of muskrat skins rose to unheard-of figures, making their value not quite equal to their weight in gold, but more than equal to their weight in silver. Who of us would have believed in his boyhood that a muskrat skin could ever bring five dollars?

The result of these excessively high prices of fur was that muskrats, long the most abundant of all American fur bearers, became comparatively rare. The animals are not in danger of immediate extinction, but there is danger that muskrat skins will become a negligible quantity on the fur market. On a certain lake, where I have known men to shoot and trap over a hundred muskrats in a day, I saw neither rat nor house while I was there on a hunting trip in September, 1923. An absolutely closed season of two years would at any time help to replenish the stock.

There are many marshes that might be converted into fairly productive muskrat farms.

The animals are natural vegetarians, but they will



MUSKRATS USE AQUATIC PLANTS FOR BUILDING MATERIAL.

occasionally eat meat. Their favorite foods are the bulbs and rootstalks of two rushes, the great round bulrush, *Scirpus lacustris*, and the grassy bulrush, *Scirpus fluviatilis*. They are also fond of the starchy roots of cat-tails. All three of these plants form great jungles in lakes and marshes and furnish the muskrats with an abundance of food and building material for their houses. They are, however, not restricted to these three rushes but use several other aquatic plants both for food and for building material.

Muskrats do not hibernate, nor do they systematically lay in supplies for winter. They sleep a good deal, but they dive under the ice for roots and bulbs, which they eat in their regular houses, in smaller

feeding houses, or in burrows in the banks. If there is open water, they frequently come out to eat their roots and bulbs on the ice.

Though they do not regularly lay in a supply for winter I have found as much as a quart of the hard little bulbs of the grassy bulrush, *Scirpus fluviatilis*, in a rat house, and they have been known to collect small stores of other bulbs.

The Eagle's Nest

There are only two kinds of eagles found in the United States and Canada—the bald eagle, which is the emblem of our country, and the golden eagle. Both are now, in most regions, rare birds.

The old saying that there are no birds in last year's nests is not true of eagles. They return for many years to the same site, and some favorite places may have been occupied for a century, but not necessarily by the same birds.

It is very seldom that an eagle's nest is accessible for study or photography. The nest of the golden eagle is generally placed on inaccessible cliffs, that of the bald eagle on solitary, tall, dead trees.

Through the kindness of a trapper, a friend and I were enabled to visit a bald eagle's nest which was quite accessible for our purpose. It was placed in the green top of a white pine. It was impossible to climb the pine without climbing-irons, and even if one had climbed it, one could not have placed himself far enough away from the nest to photograph it.

The pine stood in a hollow, and twenty feet away from it on a ridge ten feet high stood a tall spruce which I could climb to the level of the nest. The spruce tapered to a dangerously thin pole at the height of 75 feet, and swayed uncomfortably in the June breeze.



A BALD EAGLE'S NEST IN THE GREEN TOP OF
A WHITE PINE.

I did not really expect a fight with the old eagles, who were screaming and describing great spirals high above the tree tops. As a matter of precaution, however, my friend stood ready with a loaded gun. I had told him not to shoot unless the eagles attacked me in dead earnest.

When I reached the open top of the spruce, one of the birds, probably the female, came rapidly down toward me, and I could see how big she was. I could plainly hear the rush of her great wings and I could not help glancing up at the bird, who, with pinions spread to the width of seven or eight feet, was coming toward me. Within twenty feet of my head she descended; then, with a dull, deep rush of air under the wings, she drew off.

The nest was a massive platform of sticks filled in with rubbish. Some of the sticks were nearly the thickness of a man's wrist, and there was a small wagonload of them.

Three brown eaglets, as large as hens, were squatting on the nest. The parents had left with them for food a perch, the biggest fish of that kind I have ever seen. I was so close to them that I could see the color of their eyes and could observe several flies crawling about on the nest.

The eaglets looked persistently in one direction, and I poked at them with a long pole, trying vainly to make them change their position until I discovered that they were watching their parents, perched on a dead tree half a mile away on the other side of a lake.

The nest has been occupied since 1894. About 1897 the female returned in spring, without her mate. After a few weeks, an eagle with his head still in the brown plumage of youth appeared, and the widowed female accepted him in place of her lost mate.

The following spring the male's head was white, as he had reached maturity. The head of a bald

eagle does not turn white until the bird is about four years old.

There is nothing heroic in shooting an eagle. Both kinds are now so rare, and are such magnificent birds, that killing an eagle should be absolutely prohibited.

Do Eagles Ever Attack?

The question whether eagles ever attack human beings I should not answer off-hand with either yes or no. I can, however, vouch for the truth of the following incident.

The two-year-old boy of a forest ranger was playing in the potato patch near the house, when an eagle appeared and flapped his big wings so close to the child that the frightened little fellow began to scream and attracted the attention of his mother, who was busy in the house.

She ran out, but being without even a stick in her hands, could do little but add her screams to those of the boy. The eagle alighted on the fence, but when the mother threw clods and stones at him he rose and flew away.

I think the bird was a young bald eagle, just learning to catch his own food. From some place up in the sky his keen eyes had caught sight of the tow-headed boy moving about as a conspicuous object on the green background of the potato patch. Young birds and animals, just like boys, often do foolhardy things which adults would never attempt. An adult eagle, who had learned the fear of men, would never

have come near the ground close to a human habitation on the outskirts of a town.

The child was too heavy for the eagle to have carried away, but the bird was undoubtedly hungry, and if the mother had not come out, the eagle might have clawed the head and shoulders of the helpless child. I have the story direct from the mother. I do not know of any instance where an eagle has attacked or has attempted to attack a human being who was old enough to defend himself.

In years when the snowshoe rabbits are numerous, the bald eagles often remain in the North Country until midwinter. The rabbits cannot resist the temptation of crossing over the ice of the lakes, and then, in spite of their white coats at this season, they fall easy victims to the great birds of prey, who watch for them from tall trees on shore.

A few years ago, about January first, I was walking with my dog over the ice on Lake Itasca when my attention was attracted by the loud barking of the dog. On looking aside, I saw a bald eagle hovering about twenty feet above the dog.

Presently the eagle concluded that the barking, jumping dog was too big for him to handle and he withdrew to his perch on shore some 200 yards away, from which place he calmly watched the dog and me as I examined the spot where he had threatened the dog.

Tufts of hair and a few scraps of skin and blood on the snow showed that the eagle had recently caught and killed a rabbit. The dog, who almost stepped on

my heels on most of our walks, had been led away from me by the rabbit scent and in turn had attracted the eagle.

During another season a trapper friend of mine north of Lake Superior was much annoyed by bald eagles, which, in their attempts to carry off a fox he had caught, ruined the valuable fur.

In regions where ospreys, or fish hawks, are common, the bald eagle frequently robs the osprey of his prey, but about northern lakes that are well stocked with fish the royal bird of our country does his own fishing.

One bald eagle somewhere in North America ought to wear my tag, because he is legally my eagle. I found the young bird the captive of a lad on Isle Royale in Lake Superior. Captive eagles have always been a sad sight to me, and I paid the lad three dollars to let the eagle go.

Songtokecha, the Coyote

All the old travelers who crossed the plains and Rocky Mountains in the days of the buffalo speak of the great number of coyotes that followed every wagon train and made night hideous by their ceaseless howling and yapping.

The principal food of these Ishmaelites of the animal world consisted of rabbits, prairie dogs, and gophers. They cleaned up the camp site of wagon trains; they were quick to pick the bones of large game killed by the gray wolves and grizzly bears; and

they were a great menace to fawns and young antelopes.

In recent times, the sheep men of the plains have



IN RECENT TIMES MEN HAVE WAGED WAR
AGAINST THEM.

waged relentless war against them, because they are very destructive sheep-killers. It has been found, however, that they had been performing a very useful

service in keeping the natural balance of life on the plains. Where coyotes and large hawks and owls had been too freely killed, jack rabbits and prairie dogs became so numerous that they ate up the grass needed for sheep and cattle. It was found necessary to arrange large rabbit drives, and to poison, at much labor and expense, thousands of prairie dogs whose mounds and holes covered many square miles and who left not a blade of grass for sheep and cattle.

✓ The race of coyotes has so tenacious a hold on life that, in spite of ceaseless persecution, they are still found over a large part of North America. In the wooded regions of the continent, they are known as brush wolves to distinguish them from the gray wolves or timber wolves, who are much larger and are now restricted to the western cattle country, to wild wooded regions in the United States and Canada, and to the caribou country of the Far North.

Coyotes, on the other hand, are found in limited numbers in many thinly settled regions, and also in several regions where there is some broken wooded country, as along the Mississippi and its tributaries. In these regions they hunt rabbits and other small game and find plenty of suitable cover.

There is no need of fearing an attack from coyotes, no matter how much they may howl near one's camp; they feed exclusively on small game and carrion; I always enjoy the weird music of their wild, mournful call. Like the call of the loon, it is one of the unforgettable voices of the wilderness.

Patient Pioneers

It is always interesting to hear the old pioneers tell about the time when they did all their farm work and even their marketing with oxen.



TRYING TO SEE HOW SLOWLY THEY COULD TRAVEL.

To a man accustomed to rush through the country in an automobile, an ox team would be painfully slow. I used to think that the oxen I knew in my boyhood days were always trying to see how slowly they could travel without coming to a dead stop; but, in spite of their slow pace, many an ox team has traveled from Ohio and Illinois to Minnesota, Iowa, the Dakotas, and even to distant Oregon and California.

In a new country oxen possess several decided advantages over horses and mules. They are generally much cheaper. A fat ox makes good beef. Horses and mules need grain, if they are to do much work, but an ox can work during the day and find his own food after working hours and during the night.

Cattle are much less nervous and excitable than horses. If the breaking plow strikes rocks or roots, horses are apt to jerk and jump and, as a result, to break both harness and plow; but a team of oxen will exert a slow, steady pull.

The harness of horses was a serious item of expense for a poor settler, while all the harness needed for an ox team was a wooden yoke and a chain, and a skillful farmer could make the yoke himself.

The most famous ox teams in American history were those of the old Santa Fé Trail and the Oregon Trail. The Santa Fé Trail extended from St. Joseph, Missouri, to Santa Fé, New Mexico, which at that time was still a part of the Republic of Mexico.

Trains of wagons drawn by oxen started in May as soon as the new grass was well enough up on the plains to furnish feed for the draft oxen and the loose stock. From three to six yokes of oxen were hitched to one wagon. The driver did not ride in the big covered wagon, and he used no lines. He walked beside his oxen and controlled them by "Gee" and "Haw," and if necessary, urged them on with a long whip. The train boss and his assistant rode horseback, and the night herder rode in one of the wagons, so he could sleep in the daytime.

The feet of the oxen are much better adapted than those of the horse for traveling on muddy roads. Horses and mules sink in deep and then find it difficult to pull out their hoofs, because the air cannot get in below the solid, uncloven hoof.

This difficulty often caused mule teams to become mired when crossing Pawnee Creek, the Arkansas River, and other streams. On such occasions the oxen had to pull both wagon and mules out of the mud.

An old pioneer of St. Joseph once took me over the first three miles of the Santa Fé Trail and told me how they used to cross the long, dry stretch of sixty miles between the Arkansas and the Cimarron River.

"We left the Arkansas late in the afternoon," he said. "Then we traveled all night and all the next day. We carried water for the men, but for the cattle there was not a drop of water on the whole route.

"We stopped a few hours at noon for the men to eat and to give the cattle a short rest, but the animals were generally so thirsty that they did not graze.

"About three in the afternoon we started again, and we expected to reach the Cimarron about three o'clock next morning, getting over the long, dry route in thirty-three to thirty-six hours.

"When we came within six miles of the Cimarron, the cattled smelled the water and began to go faster. The poor beasts were so thirsty that they rushed madly into the river; and most of the men were so tired that they lay down to sleep without waiting for breakfast."

About Horses

The horse is a marvel of efficiency. Of all the domestic animals that have contributed so largely to the progress of human civilization, the horse has been one of the most valuable, although one of the latest tamed, helpmeets of man. The ox, the ass, the camel, the elephant have all played their part and are still doing their share of the work of the world.

All these large beasts of burden originated in the Old World. Nations which have no strong beasts of burden have never progressed far in civilization. The Inca people of South America were the only American race that had domesticated an animal larger than the dog; but even their beast of burden, the llama, was too small for the plow or for drawing wagons. The North American Indians had no beast of burden but the dog. They never domesticated the buffalo.

The fact that the Indians had no horses before the Spaniards brought them over does not seem to be generally known. The Indian ponies and the wild horses once so numerous on our western and southwestern plains were descended from horses that escaped from, or were abandoned by various Spanish expeditions.

It is true that long ago, in prehistoric times, horses did exist in North America, but, through causes unknown, they became extinct long before Columbus and even before the coming of the Indians.

When the wild horses did spread over the plains, the Indians of these regions became expert horsemen.

But that the horse was a new animal to them is shown by the names applied to it. The Blackfeet, who were not supplied with horses until about 1700, call the horse "elkdog," to this day. They knew elk and they knew dogs, and they used this curious compound to denote the horse.



INDIAN PONIES IN THE BAD LANDS OF NORTH DAKOTA.

The Indians used the horse in war, in hunting buffalo, and as a beast of burden on their frequent long journeys.

It is a curious fact that for many centuries the nations of Asia, Europe, and Africa also used the horse principally in the chase and in war. Egyptians, Medes, Persians, Israelites, Greeks, and Romans, all employed horses in war, but, for plowing the fields and

for harvesting and threshing the grain, they used cattle. The great caravans of Asia and Africa employed only camels as carriers of merchandise.

The hosts of Pharaoh pursued the fleeing Israelites on horseback and on horse-drawn war chariots, but among the Israelites themselves horses were not common before the time of Solomon. There are many references to the ox in the books of Moses, but on the treatment of the horse these books are silent. These facts show that during the time of Moses the Israelites had few or no horses.

On the Wings of the Wind

Nothing in nature is isolated. Everything is somehow connected with everything else. There is interaction everywhere between climate and plant life, between plants and insects, between insects and higher animals, and in that way the chain of life runs on and on. The organic is linked to the inorganic; the whole universe is one.

Not very many thousand years ago, a large part of the United States and Canada was covered with a heavy sheet of ice, similar to the one on which Nansen crossed the interior of Greenland. When the great ice sheet began to melt away, the southern edge melted first, so that the ice seemed to be drawing back, retreating into the north. As it retreated, trees, flowers, and animals followed it northward.

The real reason some plants can endure so much more cold than others is not understood, but it is

well known that only certain trees and low shrubs have reached their northern limit of growth. Among these are the pines, spruces, poplars, and willows whose small seeds travel on the wings of the wind.

In Minnesota and New England, spruce, poplar, and willow reach a height of fifty feet or over in half a century or less. As one travels northward, the trees become smaller and smaller; and toward the arctic zone, only a few species stay in the race until one comes to the country known to the Cree and Chipewa Indians as the "Land of Little Sticks."

North of the "Land of Little Sticks" a traveler must carry his fuel with him or camp without fuel and warm meals.

Directly south of Hudson Bay, the trees have advanced only to within twenty to fifty miles of the flat coast; but west of Hudson Bay, tree growth extends much farther north. The red squirrel and the little yellow warbler have advanced northward to the limit of trees.

A number of large-seeded trees like oaks, nut trees, and others, seeds of which depend for their dispersal on jays, squirrels, and other animals, have not yet reached their northern limit, or are found there only in small groves or as isolated individuals.

On a ten-mile walk west of Washington harbor on Isle Royale in Lake Superior, I passed through groves of yellow birches and sugar maples, but I found only one oak tree, a red oak, the only one of its kind I ever saw on the island.

The distribution of trees in some other places is

more difficult to explain. In Minnesota, for instance, the hemlock is found only in a few isolated groves on the St. Louis River, west of Duluth. The beech, *Fagus*, is not found at all in Minnesota, but both hemlock and beech are common forest trees in Wisconsin and Michigan.

How Nature Stores Her Seeds

A countless multitude of seeds are planted or tucked safely away over winter every year in preparation for spring.

The bulbs and perennial roots are kept in cold storage in the ground, to keep them from drying up. From freezing, our northern bulbs and roots are not protected. In fact, so closely are all plants adapted to the climate in which they grow that our wild flowers need the frost of winter as much as the rain of spring and the sunshine of summer.

The starchy bulbs of the jack-in-the-pulpit sleep safely only a few inches deep in the soft sand and mulch of the forest. The frost does not hurt them, but they need protection against a host of hungry rodents; and fine stinging crystals, which give on the tongue an acrid, fiery sensation, insure them complete immunity from the attacks of all woodland foragers.

A method all their own is followed by some aquatic plants, of which the wild rice is the most notable example. The seeds of this wild grain, the most important food plant of the Indians, drop into the water as soon as they are ripe. They remain dormant through

the winter, but send up their delicate grass-like blades early in spring.

They are not endowed with any protective device, and ducks and other water birds eat a large part of the harvest, but enough seed is left to produce the crop of next season. For artificial propagation the seed must be kept in moist, cool storage. If it is allowed to dry, it will not germinate.

The wild rice, which the Indians gather for food and sell to white people is parched in large kettles over a gentle fire and will not germinate.

A very different method of seed storage might be called the dry elevator process. The honey locust, the bladdernut, the so-called coffee tree, and a host of other trees, shrubs, and herbs keep their dry seeds in pods or capsules, and protect them from moisture as carefully as the farmer keeps his ears of selected seed corn.

But wild nut trees and oaks resort to the root-cellar method of the jack-in-the-pulpit, modified to suit their own peculiar needs. Their large seeds drop to the ground as soon as they are ripe. Many are covered by dead leaves and forest litter, others are planted in the ground by squirrels and jays, who do not recover all the nuts or acorns they have planted. These large seeds must be kept moist. If they become dry, the spark of life goes out and they do not germinate.

But by far the largest number of seeds nature is compelled to treat like a mother who has more children than she can care for. Thousands of plants, weeds, grasses, reeds, trees, flowers, and shrubs simply drop

their seeds to earth or scatter them with the wind. So great is their vitality that neither frost nor heat, neither drought nor flood can kill them. All they need when spring comes is a spot of earth not already preëmpted by some other plant, nor so densely shaded that every stray beam of sunlight is absorbed before it can reach them.

Some trees, like willows, poplars, and maples, plant their seeds as soon as they are dropped in spring or early summer, but the story of the seeds of this class is a chapter by itself.

Where the Trees Have Gone

Three-fourths of the area of the United States east of the Mississippi was once a dense forest, and the great problem for the settlers was to clear away the primitive growth. Each settler was at war against the forest, and when he cleared the land he burnt the trees. It was the only thing he could do with them, for he had no market for even such wood as white oak and black walnut.

Of many valuable trees, the lumber industry used to cut only two, the white pine and the Norway pine, which were used for building houses and wooden sidewalks.

About the time of the Civil War the pineries of the eastern states began to be exhausted, and the lumber industry moved to the Great Lakes region, where the supply of pine, both white and Norway, seemed inexhaustible. But to-day this supply, too, is

practically gone, and we are paying heavy freight bills on thousands of carloads of lumber from the Pacific coast.

Probably not more than one-half of the pine in this region has actually reached the market; the other half we have burnt. We have burnt pine, spruce, and other trees in forest fires, of which some have swept whole counties almost bare of tree growth, young and old.

The time has now come when we have to change our national attitude toward trees and forests. The war against the primeval forest is over. The forests are no more. The time has come when we must raise trees. We cannot simply go on cutting. First of all, we must stop burning up our growing timber. The first step in forestry is absolutely to stop forest fires.

The principal causes of forest fires are sparks from railroad locomotives; settlers burning brush carelessly and in too dry a season; bad methods of lumbering; careless campers, who do not put out their campfires or who let them get away; smokers who drop burning matches, tobacco, cigars, and cigarette stubs.

One can no longer find many fine stands of white pine and Norway pine. The finest stands of Norway pine in North America now are those which have been preserved in federal- and state-owned forests.

Like great brown pillars, each capped by a dark green crown, the magnificent old trees rise skyward. Dignified and solemn they sway and whisper in the summer breeze, and with the strength of mature years they defy the storms of the northern winters.

What a story of human and climatic changes the old giants might tell! The oldest of them began to over-top the plebeian folk of the forest—hazel, shad-bush, and other brush—fully two centuries ago, before even the adventurous French had begun to trap beaver on the headwaters of the Great Lakes and the Mississippi.

The rings in the wood of the pine trunks tell the story of drought and bad seasons, and also of good years when the annual summer shoots stretched out like long, straight candles, when the trunk was increased by a thick layer of sap-wood, and when each dominant tree out-grew a half dozen competitors. For the life of a tree is not a mere drinking in of water through the roots and of absorbing sunlight through the leaves. Where a thousand young trees started, not more than a hundred have survived the struggle for light and air. You can drive a team through the open stand of tall columns, where once the red doe hid her fawns in a thicket of young pines.

The trees that dropped out of the race have been returned to dust by worms and ants. Or running ground fires have given their substance back to the soil as food for those that survived.

Many of the survivors show the scars of severe forest fires. If the wounds from fire are not too large, the young wood will in time completely cover them. Even when the trunk is burnt half through, vigorous trees will survive, and fresh growth will strengthen the weakened trunks. For the Norway pine is remarkably resistant to fire, and rosin and the charred surface of

the wound keep out all destructive fungi and insects which would ordinarily cause its ruin.



MANY SURVIVORS SHOW THE SCARS OF
FOREST FIRES.

Even to lightning the Norway pine is more resistant than its white brother. A stroke generally splinters the white pine or breaks it in two and kills it;

on the Norway it plows a long, white gash from the crown to the ground, but the tree remains alive.

Gleaners in the Winter Woods

Very few humans, including expert woodsmen, could find in the winter woods enough food to furnish even one meal for a canary. But quite a number of birds glean their daily bread in woods and groves where snow covers the ground for five months of the year.

I never meet a flock of chickadees in the winter woods without marveling how they find enough food to keep from starving and freezing to death. They are indeed a resourceful tribe. Generally they roam the woods in small flocks of about half a dozen. All day long they keep chirping and calling to one another. If one makes a find, he invariably calls his friends, although they sometimes quarrel while feeding.

I think they do instinctively inspect the buds and twigs of orchard and forest trees all day long. And for this reason they are among the most useful of the birds. A flock of them will destroy, during one winter, millions of the eggs of various injurious aphides, or plant lice.

This kind of food, however, is almost microscopically small, and in cold weather they use their wits to discover more liberal supplies, to find larger pieces of fuel to keep the fires of life burning in the little furnaces of their tiny bodies.

When I spend a few days in my winter camp, the chickadees nearly always discover my presence from



THEY ATE SUET WHICH I TIED TO A TREE

the fact that I have thrown ashes or dishwater or scraps of food on the snow. Any place where the snow has been discolored is minutely investigated by the chickadees.

Once I cracked a number of pecans for them. They were greatly delighted with this new food. They ate heartily, and chirping and calling and fluttering excitedly, they carried off and hid every crumb they could not eat. They made such an ado that a pair of nut-hatches also were attracted to the find and took their share.

A bad storm, lasting three days, passed over the country before I visited my camp again. At first only four chickadees called, and I feared that two of my little friends lay dead under the snow somewhere,

but before long the whole flock of six was there. They were very hungry now for they ate bread which I tied to a tree. When I tied up some beef suet, they were happy and one of them ate of it while I held the suet in my hand. This time I had brought them some crushed peanuts, for which they kept coming all day, but it was quite clear by their behavior that they considered them much inferior to good Texas pecans.

One winter when the snow was three feet deep, I found the chickadees following the feeding line of a squirrel. In several places on the hard snow, the squirrel had eaten a hickory nut, and the chickadees were picking up all the minute crumbs and shavings which the squirrel had dropped and left on the snow.

No doubt, the chickadees have for many centuries followed the red hunters and the wolves in the forest and have found bits of meat and fat wherever a deer has been killed.

They are always on hand where lumbermen and wood choppers cut trees, and no insects or worms, brought out of hiding by ax or saw, escape their keen black eyes.

The winter woods would seem lifeless and lonely without the merry chickadees. One sometimes fails to find other birds on walks and tramps in winter, but it is rare indeed that the lover of outdoors does not meet a cheery little flock of the black-and-grays.

Feeding Birds in Winter

In feeding wild birds, the giver always benefits more than the receiver. The delightful glimpses one gets of the ways and habits of birds repay many times the little trouble it takes to put out the food, or the few cents one spends for it.



FEEDING A FLOCK OF QUAILS.

I derived the greatest pleasure one winter from feeding a flock of quail. There were seventeen of them. A late brood of summer they were, and when the cold weather set in, they were still quite small, although they could all fly well.

One day late in fall, but before the first snow, they

visited a bit of brush near my lawn in search of food. I threw out some corn for them on the edge of the brush, and made a trail of corn around the house. Within a few days they came regularly and sometimes they fed on my front steps.

After the first snowfall, I put out cracked corn for them under a certain tree. They visited this spot early every morning, and I generally put out the corn in the evening. If it snowed during the night, they scratched for their food like so many hungry chickens, and it was great fun to see the snow fly over their backs and short tails.

For several days one of the birds limped badly, and I feared that it might have been seriously injured, but it recovered, and the whole flock came through the winter without the loss of a bird. When the warm spring weather came they all disappeared, and I never saw them again.

I concluded that they were under the charge of an unusually watchful mother quail, which enabled the flock to escape all the cats and dogs of the neighborhood.

Certain groups of winter birds are easily attracted to any farm grove or to any place in residential districts and suburbs of cities where there are trees. These are the nuthatches, woodpeckers, blue jays, chickadees, and the little brown creepers.

All these birds, during the winter months, are much in need of food to keep their small bodies warm.

Their preferred food is suet, which is most easily fed to them by pressing small pieces of it into the

furrows of the bark on the trunks and branches of trees. Sunflower seeds and all kinds of nuts are also much relished, but birds cannot open nuts which have hard shells.

One may put up feeding boxes near a window, where the birds can be readily observed, as they soon become very tame. Chickadees, especially, are bold in winter and may sometimes be taught to take food out of a person's hand in half an hour.

After the birds have discovered the food, they come for it early every day. A pair of nuthatches used to come to my food trees every day for several successive winters from November until the first warm days of spring.

Some Troubles of Trees

A tree, apparently, has nothing to do but grow while water, air, sunshine, and mineral food come by the operation of physical laws to its roots or its leaves.

In reality, however, the tree has no such easy time. It has to work for a living no less than birds and animals and man himself.

The roots search silently in the ground for moisture and food. The leaves may suffer from drought, or from an excess of moisture, they may receive too much light and heat or not enough. The living protoplasm in the cells of the tree is constantly trying to overcome or to endure all these unfavorable conditions.

A tree is, however, exposed to many other dangers,

and it cannot run away from danger or choose to fight at some other time.

During their infancy trees are particularly helpless. Mice, deer, sheep, cattle, and fire may kill them, weeds and rank grasses may choke them. When the sapling has finally survived all dangers and competition and has become a dominant tree, it is exposed to grave new dangers.

A storm can do little damage to brushy saplings, but it will leave a path of destruction through a mature forest, and bolts of lightning are nearly always hurled at giants of the forest.

The big sequoias of California would live still longer if they were never struck by lightning. But their tops reach nearly into the clouds and make the big trees natural lightning rods between the earth and the clouds.

How tall trees are exposed to danger from lightning can be well observed in the Itasca forest. Here the old white pines overtop all the younger growth, and every summer the bolts from the clouds find some of the big trees.

It always seems to me an act of vandalism to nail signs or wires to trees; or to slash and tear down bushes, vines, and branches of trees solely in order to gather a few flowers, a little wild fruit, or a few nuts. Flowers should be cut from bushes, not broken, and fruit and nuts that cannot be gathered without vandalizing the vines or trees should be left where they grow.

The rosin of coniferous trees is a good medicine

against insects and fungi, but it is certainly "bad medicine" in a forest fire. Broad-leaved trees, on the whole, are better equipped than the conifers to resist injury from fire, insects, and lightning. They are more modern trees. They shade the ground more completely, they make less combustible litter, their wood and leaves are not filled with inflammable rosin, they are less severely injured by lightning, and practically all of them can send up sprouts from a cut stump—a thing very few conifers are able to do.

The common bur oak can resist more evil than any other tree in northern regions. It will recover from the effects of drought; it will live through the worst of tornadoes; and it will complacently embed several rings of barbed wire with no apparent inconvenience; but I have seen a wild grapevine choke a thrifty bur oak to death by robbing it completely of sunlight.

The Mink

The mink is one of the few fur bearers that have held their own since the country was settled by white men. Every creature, if its kind is to persist, must find shelter from its enemies, and shelter for raising its young. The mink's long slender body is well adapted to find shelter along streams and lake shores. The mink's diet is varied. Fish, frogs, and crayfish are its mainstay, but birds and small game are by no means refused.

In addition to these strong points for keeping a hold

on life, the mink possesses several others not so well known and understood. A young trapper friend of mine, who has observed and trapped mink for years, believes that the females hibernate for about three months during winter, because he catches no females during that time in places where they are found toward spring. This habit, by reducing the hazard on the life of females, would tend to preserve the species.

Although the mink is short-legged, he is no mean traveler. I know of one mink who traveled over fresh snow three miles in one night. He went from a wooded river bottom over an open prairie to the shore of a large lake three miles north, and the straightness of his course indicated that he knew where he was going.

This ability and boldness in travel assures a stock of minks to every suitable locality. The mink is at home over nearly the whole of America, north of Mexico.

A trapper once made an observation on a habit of the mink which is probably common with the species, but which does not seem to be generally known. My friend discovered in the month of November the winter provision cache of a mink in a large hollow root near a river bottom lake. Enough food had been collected in this cold storage cache to enable a mink to live at his ease during the longest of winters. The cache contained twenty small carp, from ten to fifteen mudhens, thirty wild ducks, and a few small birds.

The quantity of food in the cache is still more remarkable when it is remembered that a large male mink weighs only a little over two pounds. The food

in this remarkable cache must have weighed at least fifty pounds.

The ducks and mudhens had undoubtedly been killed or wounded by hunters; the provident mink had picked up the dead or had caught the crippled birds when the lake began to freeze.

White hunters in this way no doubt furnish to the mink a large part of their autumn and winter food, for a large percentage of water-fowl killed or wounded by hunters drop into thick rushes and are never found. Before the coming of white hunters, the minks did not have this abundant supply of food.

As a rule the mink does not molest poultry, except ducks that stray away from home. One summer I discovered a family of minks within a hundred yards of a poultry raiser. I asked the owner if the minks ever gave him any trouble, but he said that he had never noticed any at all.

Another time five young minks lived all summer under a brush pile, right near a farm and on the edge of a natural pond which young domestic ducks and geese had frequented since spring, but the minks had captured none of this easy prey.

One day in October, while hunting ducks on a lake, I found some two hundred dead frogs. They had all been opened, tasted, and then left. My interpretation was that this was the work of a mink, who had come upon more frogs than he could eat and had killed as many of them as he could.

The mink is one of our most valuable fur bearers; the soft and lustrous fur is much in demand for fine

fur coats. From 1919 to 1921 over a million and a half mink skins were handled by the American fur trade.

The Life of a Trapper

Almost every boy at some time of his life has wished that he could be a trapper, just as at another time he has thought of going to West Point or Annapolis.



HE LIVED IN A LITTLE CABIN IN THE WILD COUNTRY.

I had the pleasure of camping for several weeks with a trapper who had spent all his life in the pursuit of fur.

When he was a young man, he trapped and hunted on the Wabash. When fur and game became scarce there, he moved to the swamp and bayou country of the lower Mississippi. He left that country, because

as he expressed it to me: "It was too full of snakes. At periods of high water, they lay on the logs like tangles of rope."

When I met him he lived in a little cabin in the wild country north of Lake Superior. His small log cabin stood on the edge of a black spruce swamp, within ten rods of a clear spring brook. This was his home the year round, and sometimes he did not see a human face for six months.

I asked him why he did not keep a dog for company. "A dog," he replied, "would not be very happy with me. I would have to hunt meat for him, or carry in his food on my back from the steamboat landing on Lake Superior fifteen miles away. Then in winter when I have to make the rounds on my long trail of traps, I could not leave him in the home cabin. If I took him along, he would be a great bother to me, because I would have to watch all the time that he did not get into my traps or fall foul of porcupines. So I prefer to live alone, although I should like a dog for company."

Early in fall my friend's work began. He cleared the fallen timber from a trail more than a hundred miles long and stocked his five or six trail cabins with flour, bacon, sugar, and a few other necessities.

"Game may be plentiful," he explained, "but I have no time to hunt; and I could not carry any game, because on my rounds I am loaded with traps and my catch of fur."

In each small trail cabin he put up a sheet iron stove, which he carried in on his back. On this stove he

cooked his meals. In the cabins, after a tramp of twenty miles on snowshoes, he had to skin his minks, martins, and foxes, and stretch and dry his skins. Here he slept, rolled up in his blankets on a bed of spruce or balsam boughs, while the storm sang in the tree tops.

One fall he employed a family of Indians to cut out the trail for him because he expected to make a rich haul. In the month of November a fall of wet snow marked the beginning of a great storm, which dropped thousands of trees across his trail and made the woods impassable. Some of the brush never righted itself and all the alder swamps in that region were impassable for years afterwards. Instead of making a rich haul my friend did not trap at all that winter. For a month it snowed almost continually, and the drifts rose higher and higher.

"If the snow did not melt on the ground below," he wrote me, "I think it would reach the tree tops."

Is the trapper's life an easy one? I leave it for my readers to give the answer.

Tree Individuals

How winter brings out the peculiar shape and the mode of branching of our different kinds of deciduous trees! During the summer season the foliage acts as a garment, which conceals the shape and character, and the strength and weakness of each tree. But walk through a piece of woodland in winter, and note how each kind stands out like a group of statues, with trunk,

boughs, and branches sharply silhouetted against the sky.

Contrast for instance, the bur oak and the box elder. No one would think of referring to the box elder as a symbol of strength. But on the other hand, what a picture of physical strength and of rugged character the oak presents to the eye of even the superficial observer!

This is one time when appearances are not deceiving. No Washington, Lincoln, or Bismarck stood more unmoved in the political storms of his time than does the oak, which defies, in apparently conscious strength, real storms and drought and all the dangers that may beset a tree.

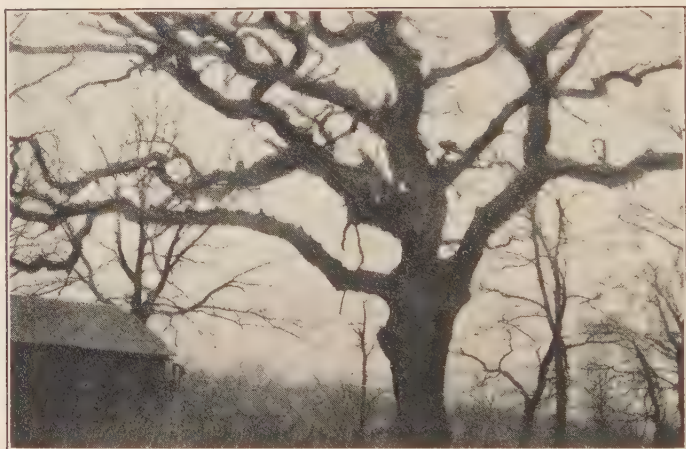
One oak, growing in an open field, was neither uprooted nor broken by a storm that lifted and bent a large iron bridge into a confused mass of rods and beams. The tornado twisted off many of the smaller branches of the tree, but against the trunk and main boughs it was powerless. In the following spring the tree put forth its young leaves as usual.

A drought some ten years ago killed many trees, and I thought that one of the fine oaks on my grounds had succumbed. A good many of the smaller branches did die, but new shoots grew out to take their places, and to-day the tree shows little sign of the battle it fought for its life.

Against a running brush fire this species is well protected by its thick, nonconducting bark, and it possesses an amazing vitality against all kinds of injuries.

I know several bur oaks that had strands of barbed wire wrapped around their trunks, an injury which will kill many trees. But the oaks have completely embedded the wire, and within a few years the injury will be no longer visible.

The bur oak prefers good soil, but it is able to live



THE MOST PICTURESQUE OAK I KNOW.

everywhere, except on very wet land and in places that are subject to floods.

The most picturesque oak I know grows on a hill of sandy soil. It must be about a hundred years old, and it looks as if it might easily live one or two centuries more.

In good soil in the forest, the bur oak attains a height of one hundred and fifty feet and a diameter of eight feet, but in poor soil or under other adverse con-

ditions it assumes a low spreading shape, as is well shown by the gnarly old oaks on stony hillsides.

The bur oak is one of the white oaks. White oaks mature their acorns in one season while all the black or red oaks need two.

Several species of oak in the Southern States, the live oaks, have thick leathery leaves and are ever-greens.

Attracting Birds and Other Wild Life

While I was visiting the beautiful Agricultural Experiment Station at Wooster, Ohio, the question came up, "Why are there so few birds in this region?" Letting my imagination travel back to my home state, Minnesota, with its countless wind-break groves that are not pastured or brushed out, and its wooded valleys along the Mississippi, the St. Croix, the Minnesota, and a hundred smaller streams; with its thousands of lakes with wooded shores and islands, I saw the answer plainly; there are no old trees with hollow limbs and trunks and there is no brush in that part of Ohio.

A few of the larger birds, such as crows and blue jays, will pick out as good a shelter as they can find and sleep perched on the branches during winter nights, but many birds that nest in cavities must also find hollow trees in which to spend the winter nights. This applies to woodpeckers, nuthatches, creepers, chickadees, screech owls, and perhaps also to the great horned owl.

Woodpeckers, nuthatches, creepers, and chickadees

have to work hard all day in winter to find enough food to keep alive. I have often wondered if woodpeckers do not frequently use up more energy in chiseling after



SPARE THE HOLLOW AND GNARLY TREES.

grubs than they derive from the grubs, when they finally bring them out speared with their barbed tongues. All these feathered insect inspectors of or-

chards and woodlands live on a narrow margin of safety. If they had to sleep in the open, exposed to icy winds, they would die; they could not find enough food in the short winter days to keep themselves warm and alive during the long cold nights.

How quickly a man's fingers will be chilled and become stiff in cold weather! And the whole body of a chickadee or creeper has hardly more substance than the first joint of a man's thumb.

Other birds, like tree sparrows, juncos, and goldfinches, sleep in low bushy thickets, sheltered from the wind. Therefore, if you would attract birds, especially in winter, spare the old hollow and gnarly trees—they are the only nesting and sleeping quarters of many birds—and leave the brush for the small seed-eaters and for quail and grouse.

Our wild honeybees and many of our interesting and harmless four-footed friends also cannot live where there are no hollow trees. Raccoons, gray squirrels, red squirrels, and flying squirrels are homeless without hollow trees; and Brer Rabbit needs the brush both for food and for shelter.

Wild birds and little animals do not like nature tampered with. They love woodlands and thickets as they grow.

Part III
SPRING

Possblummies

"The hillsides were thick with the woolly possblummies in their furry spring coats, protecting them against the frost and chill, showing purple violet on the outside of a cup filled with golden stamens." Thus writes Herbert Quick in his prairie story, *Vandemark's Folly*.



PASQUEFLOWERS, OR WILD CROCUSES.

Possblummies, an adaptation from the Dutch, would be a good rich name for our pasqueflowers, or wild crocuses, as the children seem to call them everywhere. Possblummies means Easter flowers, and it is at Easter time that they spread their purple abundance to the wind on all sunny hillsides of our great interior valley, from Northwestern Canada to Texas.

The flower is remarkably well adapted to its environment of dry, sunny hillsides, which lie baked in the sun during the long summer days and then support only a scant growth of short grasses and other plants that can endure under semi-arid conditions.

But the flowers do not await the heat of summer. Their woolly heads begin to show in little fuzzy tufts after a few warm and frostless days, sometimes as early as March 15 in this latitude.

The golden stamens attract at once a number of glossy little wild bees who, almost invisibly, dart from flower to flower, carrying their load of pollen and looking as if they had burrowed in bags of fine yellow flour.

Where these little solitary bees—they are not honeybees—spend the winter and where they hide at night I do not know; but they never fail to appear when the possblummies begin to dot the hillsides.

The long-awned seeds and the green leaves appear later, after spring has spread in earnest over the plains and hills. By midsummer the leaves have all dried and shriveled, but they have done their year's work of storing food in the underground rootstocks for the rapid growth of the flowers of the next spring.

I never have been really successful in transplanting the wild crocuses to my lawn and garden. They are attractive the first season—in fact, so attractive that thieves cannot pass them by. But they do not love hose sprinkling and will not survive under the lawn mower and the competition of the bluegrass.

Once I found a sandy hillside dotted with these

Easter flowers about the middle of July. Nature had put them through a kind of retardation process. A fire had run over the hill early in spring and had killed all early growth, including the possblummies; but they would not let the season lapse and here they were in full bloom three months later. I noticed, however, that they were paler than their sisters of early spring, and many bunches were pure white.

It would be impossible to select a national spring flower for our whole country, but for the great central valley the showy possblummies are the first real flowers of spring.

Three closely related European species are used in medicine and have a place in the National Formulary for druggists. Our Easter flower contains the same active principle, and careful experimentation would probably show that it is just as valuable for medicinal purposes as the European species.

Spare the Wild Flowers

Only a few people have learned to appreciate the rich world of our wild flowers. Picking and destroying them is still the extent of the interest shown by many people, even toward the rarest and most delicate of them.

That children should be destructive of flowers is natural, unless they are taught that a flower is most beautiful where it grows. But it makes me angry to see men and women with armfuls of moccasins and other beautiful wild flowers. Near our large cities all

showy wild flowers are rapidly becoming extinct because of ruthless picking.

Wild Flower Protection Societies are as badly needed now as Audubon Societies. "A wild flower looks most beautiful where it grows," should be the motto of every nature lover and of every boy and girl in the land.

The sale of all wild flowers, unless raised under cultivation, should be prohibited.

It was, perhaps, natural that in the pioneer stage of our country everybody should have been allowed to cut, pick, and burn; to kill, trap, and catch as he pleased. We have now conquered the continent, and the days of the pioneer are gone, but we are still altogether too much a nation of destroyers and exploiters of all that is useful and beautiful in our land.

Each wild flower has a wonderful life story of its own, as interesting as that of any bird or animal. How the bloodroot spread from Nova Scotia to Florida, I should like much to know, but nobody has yet learned the secret. The delicate white petals open only in sunlight and close at night. They are children of the woodland and will not bear carrying home. In April and early May, before the trees shade the ground, thousands of bloodroots dot the gray and brown floor of woodlands like brilliant white stars. But by late summer even the leaves have disappeared, and the whole plant has once more begun its long season of sleep in the dark, rich soil of the forest.

Violets and Pansies

To city folk, who see but few flowers not raised in greenhouses, it may be a surprise that more than fifty different kinds of violets grow wild in the woods, on the prairies, and in the meadows and marshes of North America.



ALL VIOLETS ARE FLOWERS OF EARLY SPRING.

All violets, the blue, the yellow, and the white kinds, are flowers of early spring, and all seem to be natural symbols and tokens of love and affection.

The Indians, who did not lack sentiment although they seldom exhibited it to the white stranger, have a pretty story accounting for the origin of the violet.

A young Indian warrior had fallen in love with a

girl belonging to another tribe. The chiefs and old men of the tribes, however, frowned upon the alliance just as did the fathers of rival families in Verona, because it created dangers and difficulties for those who tried to preserve peace between tribes.

The lover made his way to the village of the girl and induced her to elope with him. The tribesmen of the girl pursued the lovers, and after a long pursuit, they overtook the fugitives.

In their anger, the pursuers killed both lovers and left their bodies lying in the forest. The following spring clumps of violets grew on the fatal spot, and the wild birds carried the seeds to the hunting grounds and camp sites of every tribe.

The botanist does not find it easy to explain the wide distribution of flowers of the violet family. They have no special contrivance for traveling over great distances, yet several of them are found from Labrador to Kentucky, and from the Atlantic coast to the prairies of Minnesota. The white wood violet shown in the photograph grows from New England to Minnesota and from Ontario to Georgia.

Only one violet, the wild pansy, occurs as a rare weed in waste places in the East. It has been introduced from Europe, where it is a common field and garden weed with more than forty English names. This plant, *Viola tricolor*, also called monkey-face, Biddy's-eyes, cats'-faces, and herb-trinity, is the ancestor of the beautiful many-colored pansies of our gardens and greenhouses.

The largest and most gorgeous pansies I ever saw

were raised not by some rich man's gardener, but by an old hermit, who lived in the wilderness north of Lake Superior. The old man had converted a beach of red shingle and pebbles on Gunflint Lake on the international boundary into beds of pansies—white pansies and yellow, blue and purple; pansies smiling and pansies laughing; pansies suggesting all human moods and faces. It was worth a journey of many miles to see the pansies of the Hermit of Gunflint Lake, and the old man enjoyed bringing his finest pansies to the lady in our camp.

What strange pranks life plays with us humans! This man some forty years ago was a soldier in a European army, an army once proud and famous. He had lost his money in an iron mining venture, and had never revisited his native land. During the summer he worked in his gardens, of which he had one in Ontario and one in Minnesota. During winter he hunted and trapped, and fished through the ice.

One winter word came to the forest ranger of the district at Grand Marais that the hermit was missing from his cabin. The ranger followed his trail on the ice and found the hermit's body in twenty feet of water.

The pansies of Gunflint Lake will miss the loving care of the hermit, and I hope some other hand may help them to hold their own against the wild plants of the forest. Perhaps the red shingle beds of the wild lake may yield us a new pansy, to be known as the Hermit of Gunflint Lake.

Little Bo-Peep of the Orchid World

Many thousands of intimate and intricate relations have been developed between the world of flowers and the world of insects.

Some flowers, like the members of the carrot and parsnip family, are not specialized for any particular class or group of insects; all insect visitors are welcome to them—flies, bees, wasps, and beetles. The same is true of the goldenrods.

Many plants have become so specialized for insect pollination, that they can no longer produce seeds without the intervention of their insect visitors. This is true of our several American milkweeds, and of orchids in general.

In both groups of plants, the pollen is a waxy mass, which the wind can not even shake out of the flowers, much less transfer it to another plant.

It is not difficult for any one who will take the trouble to see how the work is done by honeybees, wasps, and butterflies on the milkweeds, because all these insects are numerous and work in daylight. But one class of honey gatherers is never seen on milkweeds—the bumblebees. The milkweed cups may be actually running over with honey, but not a bumblebee will go near them.

Much more difficult are observations on orchids, of which four species of moccasin flowers are fairly common in Eastern North America: the large pink; the large yellow; the small yellow; and the little white,

the bo-peep of wet springy meadows, *Cypripedium candidum*.

Little bo-peep, like its relatives, is a flower of mystery. I have looked for its insect visitors many times, but have never seen them. If I did not know from observations on other flowers that half a dozen wild



THE LITTLE BO-PEEPS LOOK CHEERFULLY ABOUT.

bees, when all the conditions are just right, may visit a thousand flowers in less than one hour, I would suspect that there might be some mistake about this wonderful story of insect fertilization of orchids, as told by Darwin and other careful observers.

Of a great number of large pink moccasins, which I observed through the whole season one summer, about one-half waited in vain for the friendly insect callers.

I sometimes marvel at the fact that all moccasin flowers have not become extinct long ago. Mother Nature compels them to start life against many handicaps. They are sensitive to droughts, they cannot endure pasturing and cultivation, and the usual ruthless picking; insect visitors often fail them; and, worst of all, the tiny embryos have to start into the world without a bit of reserve food.

In spite of all, the beribboned little bo-peeps look cheerfully about on the meadows, and where they find the right kind of soil, hundreds of them peep out from grasses and ferns, like groups of happy children playing at hide-and-seek.

Some day I hope to discover how they start their part in the great game of life, but thus far I have never seen an infant bo-peep.

Bobwhite

Where quail, or bobwhite, are sufficiently protected, they soon grow so tame that they become familiar dooryard birds. In the country it is not uncommon to see a flock of quail come around the barnyard and feed with the chickens.

Quail are at home in regions of farms and woodlots and in small strips of timber. They are not found in large unbroken forests, but in the narrow belts of timber which fringe the streams of the prairie states they love to dwell, and here they become numerous if the winters are favorable and they are not hunted too much.



A PAIR OF QUAILS NESTED NEAR MY HOME.

Seasons in which the snow forms a crust or the ground becomes crusted with ice cause great havoc among them, and at such times they should be fed small grain and cracked corn in places sheltered by brush and bushes.

One spring a pair of quails nested near my home on a wooded hillside within the city. Some boys found the nest early in April, when it contained two eggs. Then the weather turned cold and dry; insects disappeared and plants stopped growing. I did not see the birds, and thought that the mother bird had been killed or that for some reason the nest had been deserted, because no eggs were added for a week or ten days.

The weather changed. There was a warm rain; insects became abundant; and everything began to

grow. When I next visited the nest, I was surprised to find that the bird had begun to lay again. She added one egg daily until the little cavity, well hidden by dead grasses and weeds, contained nineteen plump, white eggs.

In spite of dogs and cats in the neighborhood, the mother bird raised a brood of seventeen chicks. One egg had been destroyed, one was still in the nest but seventeen empty shells told the rest of the story.

The embryo quail is provided with a sharp point on the top of the bill. When the time arrives to leave the confining shell, the chick turns almost a complete circle, and, in the larger end of the egg, cuts the shell until a narrow hinge is left. Then the lid is pushed open and the quail chick slips out. There were seventeen egg shells each with a neatly cut lid. But mother and chicks were gone; for young quails run about with their mother like domestic chicks with the hen, and do not return to the nest.

I opened the egg left in the nest. It contained a well-formed chick, but the little thing was dead. The egg had lain lowest in the nest. It had been a little slow in hatching, and the mother had sacrificed one egg for the safety of her seventeen chicks, who were ready to leave the dangerous nest.

Quails are great destroyers of insects, and I should like to see them taken off the list of game birds and given the same permanent protection that robins and other songbirds have. Personally, I could never point a gun at the little wild chicks of the woodlots.

Chipmunk Neighbors

I have been wondering why some larger wild animals keep a hold on life in and near the suburbs of our cities, while the friendly little chipmunks gradually disappear.



THE FRIENDLY LITTLE CHIPMUNK.

I think the cause is cats. People still keep too many cats in town. The red squirrel finds refuge in trees, the cottontail rabbit is watchful and speedy, the skunk has his own peculiar armament; but the little striped chipmunks, as they nibble their acorns or hazelnuts on a stump or rock, one after another fall victims to the spring of some prowling cat. Though it is true that some cats seldom, if ever, trouble any domestic mice, they all catch birds and small wild animals.

On the wooded hillside near my home, several little wild neighbors lead their simple lives, and here I used to see the first chipmunk about the time the maple sap was running. But now the chipmunks have disappeared. The last one I saw in the spring several years ago as he was making a meal off the young shoots of a red oak.

Away from the abode of too many house cats, wherever there are trees and rocks one may find chipmunks from early spring till fall. They are common along all the stone fences in New England and New York State, where John Burroughs loved to watch them.

Among many with whom I made friends at my various camps, I remember very distinctly one I met on the top of Harney Peak, the highest mountain in the Black Hills of South Dakota. I had made a brisk climb to the highest point of the wreath of granite which encloses a patch of delicate grass and daisies, a tiny alpine meadow, from which trickles a fine clear spring, the highest in North America east of the Rockies.

I rested an hour on the granite crown of the mountain, and feasted my eyes on the panorama of the buttes, crags, canyons, and mesas of the Bad Lands, spread out before me toward the east. In this solitude a little pale-colored chipmunk approached me as if I were an old friend and he had been looking for my arrival. I divided my sandwiches with him, gave him all he could eat and enough for a day more. He seemed to be as hungry as I was, and I have often wondered, whether, like me, he had just done a little mountaineer-

ing for the fun of it, or whether his home was on the peak in the clouds. If he lived there, I suspect he had made a nest somewhere about the United States forester's cabin in a corner of the little meadow. He must have drawn some rations from the flour and other provisions in the cabin, for I saw no natural chipmunk food on the crown of Harney Peak.

At my camp in a forester's cabin in the Itasca Forest I made the acquaintance of three half-grown orphan chipmunks, who at first annoyed me by sampling all my provisions which were not in tin cans or hung up out of their reach. They were so hungry that they even ate my raw potatoes. As I saw neither of the parents I served the orphans two liberal meals a day of crumbs and scraps. They would come and eat off a tin plate like three motherless kittens, and they never quarreled at the meal. There was to me something pathetic about the little creatures, something that reminded me of human orphans. What calamity could have carried off both parents? A weasel or hawk would more likely have killed the inexperienced young.

After a few days I discovered the secret. Near the cabin was an old well, about twenty feet deep, with boarded sides. Removing the cover from the well, I saw some objects on the pool of cold water. They were two adult chipmunks, male and female. In some way they had both fallen into the cold pool, and had not been able to climb up on the wet, slippery boards.

I shall never fire a gun or a pistol at a chipmunk, and there will be no open pit well on my place. Where an open pit well is necessary, the suction pipe should

be driven into the gravel, or the pit should be partly filled with clean gravel, to make a dry hole. This plan insures clean water; the dry hole can be used as a cool cellar in summer, and there can be no more tragedies like that of the parents of the little orphan chipmunks.

Lucky Thirteen

In the life of the opossum, thirteen is a lucky number, because the young opossum spends its infancy in a baby incubator, which is equipped for thirteen tiny guests.

The opossum is in structure unique among the mammals of North America. It belongs to the strange, ancient order of pouch-bearing mammals, which are now found in large numbers only on the continent of Australia and some adjacent islands. It has several relatives in South America, but our only species must have come north long before the advent of man on the continent.

An adult opossum weighs about twelve pounds, but the young, at birth, are no bigger than baby mice. They are at once transferred, like the young kangaroo, to the pouch of the mother, where they attach themselves, and for about five weeks they are fed by the milk of the mother without leaving their place of safety.

After that time they begin to explore the outside world, but they do it on the back of the mother, clinging to her fur with their tails coiled around her tail.

The mother presents a most curious aspect of a walking nursery.

How the opossum has survived to the present day and how it manages to keep its hold on life is one of the mysteries of nature. Deer, elk, wolf, bear, raccoon, wildcat, lynx, and panther have had their range much



Courtesy of A. E. Du Quoin, Petersburg, Ill.

THEY HAVE LEFT THEIR WALKING NURSERY.

restricted; but the dull-witted, slow, and almost defenseless opossum is still found over much of its ancient range, which extends from the Atlantic coast to the Mississippi and beyond.

It is, however, small enough to find shelter under stones and woodpiles, under roots and in hollow trees, and it eats everything that is edible—bulbs, and roots,

eggs and young birds, and all kinds of fruit. Its fondness for wild persimmons is proverbial. It has no aversion to fresh chicken,*and it is a prolific breeder.

These points of strength on the score card of life must overbalance its weak points, or the animal could not survive.

No other American animal has given rise to a proverbial expression, which every child understands as well as he does "playing possum." But of what benefit his strange trait of rolling himself up into a ball and playing dead can be to a creature like the opossum is difficult to see.

Many insects, when disturbed, drop to the ground, and by playing dead they become invisible, but the opossum is too large to secure a like benefit. Dogs, boys, and men are not deceived, nor is it likely that wolves, foxes, and bears were ever fooled in this way. If the creature would only use his ability to run, he very often could escape, but that is not his way. When overtaken and touched, he rolls up, opens his mouth wide and allows himself to be killed. Perhaps under conditions that have now passed away, this strange habit was of benefit to the race, and it persists as a fixed instinct, although it is now positively harmful to opossums.

C. C. Abbot, who observed many opossums near Trenton, N. J., believed that the animal really faints with fear, and does not "play possum" at all.

Dallas Lore Sharpe is of the contrary opinion. He thinks the creature has no nerves, but is amazingly cool. According to this observer the animal really

"plays possum" and in that way often baffles and surprises his captor or enemy and gets a chance to escape.

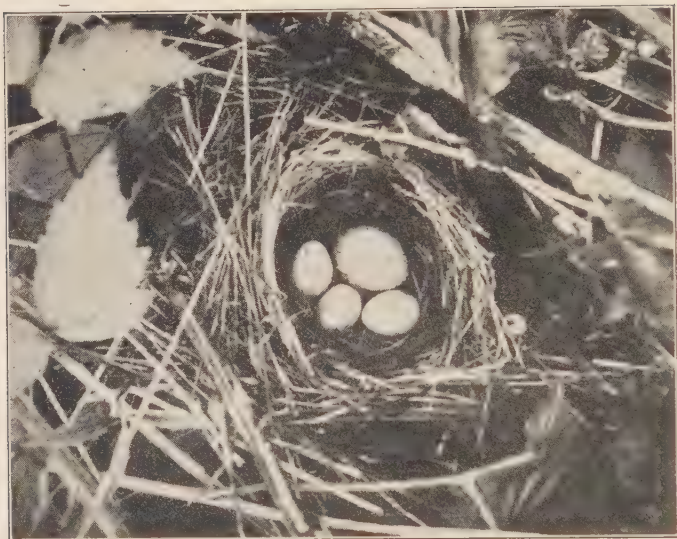
The Cowbird

The cowbird is a pariah. He is the only parasite among North American birds. Cowbirds do not build nests of their own, but lay their eggs in the nests of other birds, mostly of birds smaller than themselves. Captain Bendire has compiled a list of 91 birds that are made the victims of this impostor of the bird world.

Many of our beautiful and beneficial warblers, like the redstart, the yellowthroat, and the yellow warbler, are frequently made the victims of this bird without a conscience. All our native sparrows, like the chippie, the grasshopper-sparrow and the whitethroat, are imposed upon by the parasite. Even birds fully as large as the cowbird, such as the red-winged blackbird and the wood thrush are not spared.

During the latter part of June and during July any of these birds may be found busily feeding and following a noisy young cowbird, who is incessantly clamoring for food and more food.

What becomes of the young of the deceived foster parents? The answer is that their eggs are either not hatched or the young are starved to death, for nobody has ever seen the foster parents feed any of their own nestlings, while they were anxiously working to fill the capacious maw of the young bantling.



LARGER THAN THE EGGS OF SPARROWS.

As cowbirds range in summer from northern California and North Carolina well into Canada, the number of useful warblers, native sparrows, thrushes, and flycatchers which the parasites destroy must reach an enormous total. I believe that 2,000,000 is a conservative estimate. Cowbirds do some good by eating injurious insects and weed-seeds, but the harm they do is out of proportion to the benefit they render.

The eggs of cowbirds are evenly speckled with brown which gives them a neutral-colored appearance. They are larger than the eggs of warblers and sparrows, and sometimes more than one are deposited in the same nest; but I do not know if the victimized parents ever raise more than one bantling.

I do not like to interfere with bird and beast, but I do destroy every cowbird egg I find.

It is strange that, as far as known, only one bird has grown wise to the trickery practiced by the cowbird. This is the yellow warbler, who frequently builds a second story over the parasitized nest, and thus prevents the cowbird egg from hatching. This fact may explain why the pretty little yellow bird is one of the most numerous of all our warblers.

I have never known the robin to be imposed upon by the cowbird. Cock robin and his mate are excellent parents, and in the defense of their nest they are keenly watchful and aggressively belligerent.

Cowbirds belong to the blackbird family, whose other members are all excellent parents.

Mr. Otto Widmann of St. Louis has suggested to me that the cowbirds' character may have deteriorated in the following manner:

"Long before the country was settled by white people, the cowbirds began to associate with the buffaloes in their spread over the continent, just as now they find their food near domestic cattle. Following the daily wanderings of the buffaloes, the birds could not remain near their nests, and gradually acquired the habit of laying their eggs in such nests as they could find and were allowed to enter."

The Home of the Redwings

I often think that primitive man learned some of his arts and crafts from birds and animals. In the making of baskets our Indians may well have gone to school with the red-winged blackbirds.

The redwings seem to adhere to a division of labor as rigidly as do the Indians. The plain brown-and-black striped females do all of the work in camp, while the red-epauletted males look on and encourage them with cheery "oakalees" and spend much of their time in displaying the conspicuous jet black and scarlet red of their plumage.

The males are, however, exceedingly good watchmen. One can sometimes approach a robin's nest without being observed, but never the basket cradles of the redwings. One or more sentinels are always on duty and I have never been able to approach a nest unobserved.

There is a legend that the European cuckoo could not make up his mind where to nest, and for that reason he has no nesting place to this day. The redwings evidently did know what they wanted, for they chose one of the safest nesting places in the whole bird world. The nests are always on rushes surrounded by water, so that no cat, red squirrel, or other prowler can get to them.

Crows, jays, owls, and hawks do not like to hunt in thickets of rushes over water. I have never seen one of these nest bandits attempt to rob the redwings.

In this respect the nesting habit of the redwings seems to be perfect. There is, however, one strange defect in their instinct. In all the thousands of years they have woven their baby cradles in the cat-tail marshes, they have not learned that the stout stalks furnish the only safe supports. They attach the nests



ALWAYS ON RUSHES SURROUNDED BY WATER.

indiscriminately to leaves and stalks. The result is that in rainy weather, when the nests become soaked and heavy, the wind blows over all those that have been attached to the flexible leaves, and many young are drowned and many eggs destroyed by being thrown into the water.

For a long, long time, the redwings must have nested in cat-tail swamps, and it is strange that they have not learned that cat-tail leaves are not safe supports for their rather bulky nests.

The Tides of Bird Life

The bird life of the earth flows back and forth between north and south like a great tidal wave.

The northward sweeping wave in spring is much more marked than the southward traveling wave in fall.

In spring the migrating hosts are as much under the spell of the all-pervading throb and thrill of love and new life as flowers and trees.

In fall, most birds drift along leisurely and loiter much by the wayside; while in spring an irrepressible impulse urges them to hasten their journey.

No sooner are the margins of swamps and lakes free from ice than the redwings and their kin enliven the dead marshes, solitary blue herons fish for frogs and pickerel, flocks of wild duck come on swift whistling wings, and long lines of wild geese are winding north to their subarctic summer homes. All these early migrants keep right on the heels of winter, as if they were impatient of the slow progress of the seasons.

Among the earliest arrivals are the bluebirds and the robins. The crest of the wave does not reach the northern states and Canada till May. The wave of the little wood warblers does not generally appear till the second week in May. By the fifteenth of May all our common summer birds have arrived, and when the wild ringing cry of the great crested flycatcher is heard in the woods during the third or the last week

in May, the great tidal wave has come once more to rest.

Spring travels northward at the rate of about thirteen miles a day, and when the far-going migrants, like the little yellow warbler, leave the gulf coast they travel at about the same speed. But as they approach their northern nesting grounds, they increase their speed, and when the yellow warblers reach northwestern Canada, the head waters of the McKenzie, and the region of Great Slave Lake, they increase the rate of their flight to two hundred and fifty miles a day.

It often seems as if whole flocks of birds had dropped out of the sky during the night, and that is just what many of them do. They travel by night, especially on clear moonlight nights, while during the day they feed and rest.

Among the red-winged blackbirds, the males are more impatient to reach their northern marshes than the females, for they always arrive about two weeks in advance of their dun-colored mates.

Birds that arrive last in spring are the first to leave again. The yellow-headed blackbirds and many warblers start south in August.

Most birds probably remain mated for life and return to the same neighborhood year after year. I have known a female blackbird marked by a few white feathers in the tail that returned to the same small swamp several years. Robins and bluebirds having some individual mark of recognition have also been known to return to their former home, and one can sometimes tell from the behavior of birds that the

feathered neighbors of the previous summer have come back.

Some Strange Facts about Angleworms

The man who desires to go fishing late in the fall or in winter will find it almost impossible to supply himself with worms, unless he knows just where to look for them.

They may always be found, generally in abundance, near the edge of old manure piles, where, on account of the heat evolved by the decaying straw and litter, the frost is kept out. In places of that kind they remain active all winter.

The worms that are found in rich soil during the summer go down to a greater depth in autumn, and are hard to find late in the fall. I do not think that they all go below the frost line; they probably have the ability to survive freezing, if it takes place slowly and if they thaw out slowly as the ground thaws in spring.

Darwin wrote one of his famous books on the action of earthworms on the soil, but it seems that the great scientist was not aware that these lowly creatures, so common everywhere in England and other European countries, never were found, and are not found now, in wild places in America.

I have looked for them at all of my wilderness camps, but have never found any. All trappers and campers whom I have consulted corroborate this fact.

There are no earthworms in a wild country, unless they have been accidentally introduced, or somebody

has intentionally planted them. Whether earthworms were in the early days found in the garden patches of the Indians, I have not been able to discover. None of the old journals which I have read mentions earthworms or angleworms at all. It is probable that these creatures, like most of our field and garden weeds, were accidentally brought from Europe.

Some people believe that it occasionally rains angleworms, but this belief is based on careless observation. The worms cannot travel on dry ground, but after a rain, especially during the night, they emerge from their burrows in obedience to the instinct of all life to spread and fill the earth.

On such occasions, thousands of them become lost and tired out on cement walks and paved roads, where their numbers give the impression that they have come down with the rain.

In the East, angleworms are known as night walkers. But even during the darkness of night, the humble creatures fall a prey to many enemies. During the day they form the principal food of the robins, whenever cock robin and his mate can discover them on the lawn.

How Nature Plants Forest Trees

Three things must meet where nature is to plant a forest—the time, the soil, the seed.

Everybody who has ever been in a natural forest in the Adirondacks, the hills of New England, or in the Great Lakes region has carried away in his memory



I KNOW A STAND OF YOUNG BIRCHES.

a picture of some beautiful stand of timber, as uniform in size as the stalks in a well cultivated field.

It may be a temple in which the pillars are the tall, straight trunks of mature pines. Such temples have become very rare—so rare indeed that the few which still exist should never be cut, but should be preserved to delight the eyes of our children and our children's children.

It may be an even stand of spruce and tamarack that covers a seemingly endless muskeg swamp; or, most beautiful of all, a grove of white birches, through whose open crowns the sunlight plays on the woodland flowers.

In most cases a fire has cleared the ground for the

seeds. Then the seeds have been scattered evenly from some nearby parent trees, and the weather has been favorable for the seeds to find a good hold on the unoccupied ground.

I know a stand of young birches among which I love to loiter on my walks. It covers a sandy hillside facing north. If the soil were more moist and less sandy, it would be covered with a thicket of aspen; if it were a rich, river-bottom flat, a grove of cottonwoods would occupy it; for aspen and cottonwoods scatter such abundance of seed that they miss no vacant spot in their territory.

But the soil and the exposure on the hillside are best adapted for the airy white birches. Several old seed trees grow close by, and so it happens that here is as fine a grove of birches as one could wish to see.

The trees are all of about the same size, for the seeds all sprouted within a year or two of each other.

On some stands of young trees I have followed the development of a grove for several years.

A patch of dry lake bottom was one spring thickly seeded to cottonwoods and willows. But the cottonwoods found the water level too close to the surface, and by the end of the third season, they had all been shaded out by the vigorously growing willows, who love just that kind of location. Some of the willows had attained a height of eighteen feet and formed a dense thicket.

On several filled lots I saw a dense growth of cottonwood seedlings come up some years ago. But

a neighbor staked out his cow on this patch of fresh pasture, and she browsed and trampled to death all the young trees, except a fringe beyond the length of her tether. The area where the animal browsed is now a grassy pasture without a tree; but the trees on the margin have grown to be some twenty feet high.

On the area grazed over by the cow, the bluegrass has formed so dense a sod that no tree seeds have been able to secure a hold.

A Destructive Mania

One of the worst tendencies that is observed by those who are interested in the conservation of beneficial song birds, game birds, wild flowers, and trees is our lawlessness about setting fires. Almost every spring, unless the weather is too wet, and usually in the fall, some parts of the Hudson Highlands, the hills and marshes of the Minnesota, the hilly slopes and bottoms of the Mississippi and its tributaries are burned over by forest fires.

Fires run sometimes for days. They destroy every bit of young growth of timber. One can walk for miles through parts of the bottom and the hills where oaks and even pines are trying hard to get a start without finding a single young tree or seedling. Their efforts to grow do not receive man's aid. Every year, and sometimes twice a year, fires are allowed to run along the slopes; every bit of young growth is killed and older trees are injured and become sickly.

The injury these fires do is not limited to desirable

trees and plant growth. They cause havoc with ground-nesting song birds and game birds. All these birds nest early in the season, and quail, grouse, prairie chickens, ducks, and many song birds have their eggs and nests burned. The hillsides, ravines, bottom lands, and marshes where these fires run are natural



A STEEP HILLSIDE DENUDED OF ITS GROWTH.

bird and game and wild flower refuges, but their utility and beauty is every year partially destroyed by fires through the criminal neglect of the people.

There may be a reason why a man should burn over a meadow or a piece of ground that has to be cleared of wild growth, but the man who allows fire to get away from him is committing at least a criminal misde-

meanor, and should be as heavily punished as the law allows. On wild land, the grasses and weeds should be left to decay and add to the fertility of the soil. That is the way nature has made the soil fertile ever since plants began to grow on earth.

Burning the grasses and weeds converts back into soluble form the mineral salts which the plants slowly collect in the black humus near the surface. From a burnt-over country, the natural fertilizer is quickly leached out by the rains and run-off surface water, and carried into the streams. The soils thus treated are given a progressive treatment of impoverishment.

On steep hillsides that are denuded of their growth, destructive erosion very quickly sets in and will do as much damage in ten years as any human agency can make good in a hundred years.

Destructive erosion is even now washing away many acres of fertile land in the valleys of the Minnesota, the Mississippi, and almost every river in the United States and in the region of the Alleghanies.

If we really want birds and wild flowers and game and forests and clear streams, we must abandon our criminal negligence in the use of fire.

Much of the fertile land, once destroyed, can never be reclaimed. It is gone, and its fertility is carried into the sea.

A Bird with a Bad Habit

Of all the birds of the woodpecker family, the sapsucker is the only one that has fallen into evil ways.

I fancy that its ancestors were respectable woodland carpenters and grub diggers like all other woodpeckers, who not only dig out their own nesting cavities in old and dead trees, but build houses for many other useful birds, such as wrens, chickadees, tree swallows, and nut-



THE SAPSUCKER HAS FALLEN INTO
EVIL WAYS.

A long time ago the sapsucker discovered that a sugary sap, good to drink, flows from many trees if the bark is punctured, and now he and his clan have become unredeemable toppers. The injury which he causes to forest trees, such as basswood, maple, and elm, is generally negligible, although I know an elm into which the sapsuckers have dug 30,000 pits, giving the trunk the appearance of having passed through a severe case of smallpox.

The bird's habit, however, is most injurious to fruit trees and ornamental trees. Most of the sapsuckers nest north of the latitude of St. Paul, and on their spring migration they tap the same trees year after year. Mountain ash, Scotch pine, and apple trees are their favorites. In the course of years they completely ring the trunks with their sap wells, so that the trees sicken and die.

Why they work on one tree and pass by another of the same species has long been a puzzle to me. Near my camp on the Big Fork River stood two elm trees on a meadow. To one of the trees a sapsucker came every day to drink his fill. When one of his wells ceased to flow, he dug another, but he always worked on the same tree and never touched the other, which was of the same kind and age as the first.

On some alder brush in Itasca, a sapsucker had opened more wells than he could pump dry, and a hummingbird and a swarm of wasps came regularly to drink the overflow from his oozing sugar wells.

Once I found a sapsucker dead with his bill smeared with cream candy. My interpretation was that the bird had found a piece of candy and had indulged his love for sweets to a fatal excess.

The sapsucker is a beautiful bird with the general markings and habits of woodpeckers. In spring and summer he drums on dead branches to call his mate. One sapsucker, who lived near one of my northern camps, had discovered that an empty tobacco can, left on a tree by some forester, made a louder noise

than a dead branch, and he came quite regularly to call his mate by drumming on the tin can.

The American Robin

While it would be difficult to agree on a national flower, there could not be much disagreement on the selection of a national songbird.

No songbird is more universally distributed than the robin. He is found as a summer resident from the Atlantic coast to the Pacific and from Canada to the middle states, and in the South he is well known as a winter resident. Until recently he was considered a game bird in parts of the South, and thousands of robins were offered for sale in the market of New Orleans.

The robin seems to have all the qualities of a successful songbird. His diet is not limited. He eats worms, insects, berries and many kinds of seeds. Nor does he limit himself as to nesting sites. Generally he builds on trees, but I have found nests on the tops of stumps only a few feet above the ground. I also found one nest in an abandoned machinery crate on a railway station platform. He has been known to build on verandas and the timbers of railroad bridges, and the western robin will even build on the ground.

Our eastern robin has become the most familiar dooryard songster. No sooner are the first few houses built and the first trees planted in a new town, than the robins appear and make their home with man.

They are exceedingly good parents. No robin ever

needs to be taken into court for neglecting his children. No pair of robins will allow their nest to be robbed without putting up a vigorous fight. If a red squirrel or cat appears near the nest, cock robin and his mate at once sound a general alarm, and the intruder is generally beaten off.

Some red squirrels used to visit an oak tree in my



A ROBIN'S NEST ONLY A FEW FEET ABOVE THE GROUND.

yard, where a pair of robins had built their nest; but the robins soon impressed Reddy with the fact that that particular oak tree belonged to them, and they raised their brood successfully.

The English robin, after which the first settlers named our bird, is only about the size of a chickadee. The English or European robin is not found in America, and the American robin is not found in Europe.

The Snapping Turtle

It is difficult to see why some creatures are not much more numerous than they are. The snapping turtle is one of them.

The creature inhabits fresh water lakes and rivers and is well able to take care of itself on land, although it is a slow traveler.

Its armor, or carapace, is so hard and strong that the turtle seems well protected against all its enemies, except when it is very young. Nor is its defense limited to its armor. When disturbed on its rambles on land, it does indeed withdraw into its bony castle, but a vicious hiss gives warning to the enemy; a formidable beak shoots forth, and woe to dog, boy, or man whom it seizes.

The snapper has no teeth, but one might say that his jaws are all teeth, and he holds on with bulldog tenacity. The hard beak will dent wood, and the only way to make a snapper let go quickly is to cut his head off.

Snappers frequently draw young ducks under water and eat them. Once my camp partner saw an adult wild duck seized by something under water. He could not see what had seized it, but the duck flapped its wings and quacked and struggled till it broke loose. I think the duck had been seized by a turtle, but to my surprise it did not fly away, but remained on the river for half a day after the incident.

I know of only two natural enemies to the snapper. Occasionally a snapper will take a fisher-

man's hook, and when drawn out of the water the unprotected places on its body are found to be thickly covered with leeches, commonly known as bloodsuckers. I do not know whether these ugly parasites ever kill turtles; but it seems that they must seriously interfere with their growth.

The snapping turtle illustrates in a surprising manner the complex system of checks and balances in the wild life of every country and continent. The most important check upon the increase of our land turtles is furnished by the skunk.

Turtles lay their eggs in holes they dig on land, but they do not watch or brood their eggs, they merely cover them with earth, level off the ground, and depart.

The great majority of the eggs laid never hatch, because the skunks dig them out and eat them, leaving only the white leathery shells as marks of their work. The skunk is a thorough-going forager, and very few good things escape his keen nose and active paws. I have even known a skunk to dig out the young of a kingfisher who had carelessly dug a tunnel in a low gravel bank.

I have no doubt that foxes, minks, wolves, and bears also rob the nests of turtles. These four-footed hunters all know what is good to eat, and how to find it; and fresh turtle eggs make a very passable omelette, not quite as good as hen's eggs, but good enough for any hungry camper.

I have found hundreds of turtle nests that have been robbed, but only once did I find eggs ready to hatch. These eggs had been plowed up in rich black soil the

first week of September within two hundred yards of a large, shallow lake. On this lake the little baby snappers, about the size of a nickel, are quite numerous every fall in the duck-hunting season, but the larger turtles, weighing from five to twenty pounds and over, are not becoming more numerous.

How the little ones are destroyed, I do not know. Is it the leeches? or do the herons and bitterns prey on them? Perhaps pickerel and bass also catch the little creatures.

A big snapper is a savage brute, but I am always glad to meet one. It assures me that one may still find on his rambles a little of the romance of the wild.

What Becomes of the Deer Horns

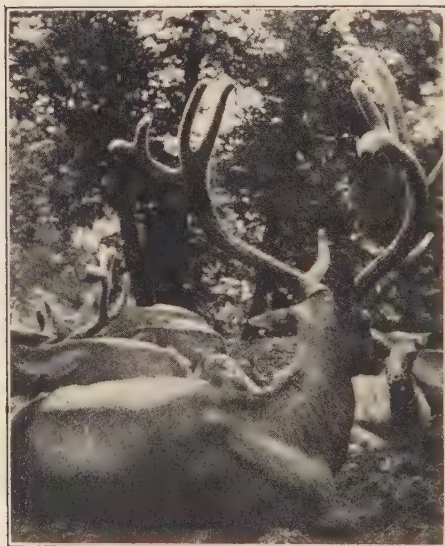
Our domestic sheep and horned cattle grow only one set of horns during their lifetime, but with all the members of the deer family nature follows a strangely different method.

Deer, moose, elk, caribou, and reindeer grow a new set of horns, or antlers every year. Of most members of the deer family only the males are provided with horns, but of reindeer and caribou both sexes have antlers.

Late in winter or very early in spring, moose, deer, and elk shed their formidable weapons. The process leaves two sore-looking spots on the head of the animal, but very soon new antlers begin to grow. The new antlers, during their period of growth, are covered with skin and a fine velvety hair. While the antlers are in

the velvet, they are filled with nerves and blood-vessels and are very sensitive. I have seen a buck carefully brush off a mosquito that had inserted its beak in the growing antler.

About the end of August the antlers have hardened and become lifeless, bony matter.



ELK WITH ANTLERS IN THE VELVET.

The animals now peel off the skin by rubbing the antlers against brush and trees. In fall, the buck is ready to do battle with his polished antlers.

One would naturally think that the formidable antlers served principally as weapons of defense against wolves and other enemies, but such is

not the case. The males use them most in doing battle against one another. In spring, when the fawns and calves are born, the new soft antlers of the males are worse than useless, and the protection of the young is left entirely to the does and cows, who can strike vicious blows with their forefeet.

A pair of moose or elk antlers weighs from thirty to

forty pounds, and I imagine that it takes about a ton of food to produce this weight of hard, bony substance. It seems a very wasteful process to repeat the growth of these great weapons every year, but it is the natural habit of the deer of all countries.

The question what becomes of the thousands of antlers dropped every year is often asked. The answer is that they are eaten up by the small woodfolk, by the wild mice, squirrels, and porcupines. It seems a strange taste, but the facts are beyond dispute. So universal is the appetite of these rodents for deerhorns that one hardly ever finds a perfect antler.

I once found a place in a tamarack swamp where a buck had shed his antlers, but only a few pieces and scraps were left of them. A porcupine had visited the place regularly. He had been occasionally disturbed at his strange meal; for close by, under a tamarack root, he had a place of retreat. To this place he had retired, when an enemy had threatened him; or, possibly, he had camped there over night, for he had left several of his quills in his fort under the roots.

How Animals Get the News

Most men learn by seeing; most animals learn by smelling. A man says, "I saw it." If an animal could talk, he would say, "I smelled it."

Only a few of the larger animals stand up high enough to get a free view over brush and tall weeds and grasses. Such smaller animals as foxes, minks, weasels, are compelled to depend on their keen scent



A MOOSE FEEDING IN A LAKE.

both for finding their food and for avoiding their enemies.

People who go noisily through the woods see very little wild life, for the woodfolk possess a keen sense of hearing as well as of smell.

One summer day I was observing a moose feeding in a lake. In a short time, I noticed the animal stand at attention and direct his big ears toward the shore. A little later I heard some of my friends talking; but the moose had heard them when they were more than two thousand yards away.

Most animals find it difficult to discover or make out by sight anything not in motion. On the day I watched the moose, two friends and I approached in a boat both moose and deer within about twenty-five

yards or less. We paddled without noise, while the animals were feeding, but we stopped as soon as they looked at us, and none of them became alarmed till we came within close range. Of course, we approached all the animals with the wind in our favor.

Once I almost walked into the arms of a black bear. I was going along with a light pack on a soft forest trail, when suddenly, about three yards in front of me, arose the hind quarters of some large black animal which immediately broke noisily through the dense timber. It took me a few seconds to realize that I could have touched a big bear with my stick, if I had seen him in time. The bear, I believe, had heard me, and impelled by curiosity, had sat down to watch me. If the wind had been toward him, I never should have seen or heard him.

The most remarkable story of this kind I have heard is that of a fox, who on a still day approached within six feet of two foresters who were standing quietly. Then he stopped, sniffed the air, and leisurely returned on his trail. He was not alarmed, and he never really saw the men.

The fox looked old and was in poor condition. The story is so unusual that I can explain it only by the theory that the animal had reached the age of vulpine senility.

Animal Engineers

Among animals as among humans, certain traits, abilities, and shortcomings run in the family. The dog and all his kindred are marvelously gifted as hunters and trailers, and are highly intelligent generally; but in the matter of mechanical insight and ability the family is so near zero that the whole tribe, wild dogs, common curs and dogs of high degree, belong in the feeble-minded class.

Wild dogs have learned to dig a hole for their young, and Bowser and Pluto will learn to push open a swinging door with their noses, and that is about the limit of their mechanical insight and ability. To teach one of them to pull a stick through a hole lengthwise would take a month of patient training, if he could comprehend it at all.

On the other hand, the large order of rodents, although they rank low in general intelligence, possess marked mechanical ability. Perhaps the fact that they can use their forefeet as hands has aided them in becoming the master mechanics of the animal world.

Of all the mechanics among the rodents, the beavers are easily the best, and their work is so astounding that they deserve the title of Animal Engineers. The first time one comes unexpectedly upon a large beaver dam, he finds it hard to believe that the long winding dam under his feet is the work of animals. It is so suggestive of human hands that a company of active boys in camp might well have done the work to insure water



THEY USE THE DISCARDED POLES IN THEIR HOUSES.

deep enough for swimming or a pond large enough for boats and canoes in summer, or for skating in winter.

As the dam is always adapted to the contour of the land, it is irregular in outline. It may be from a few rods to a quarter of a mile long, and from five to eight feet high where it crosses the bed of the stream.

The favorite streams for beavers to dam are what fishermen would call small and medium-sized trout streams, but they will attempt to control streams from ten to fifteen feet wide.

It is a common belief that beavers cut down trees and then drive posts and sticks vertically into the bottom of the stream, as a man might do working with an ax. The beavers could not follow that plan, even if

they wished to do so. They do cut down trees for food, and then use the peeled and discarded poles in their dams and houses, but the principal materials for the dams are dead branches, brush, and sticks, which they drag to the proper place, where they lay them down in a rough way, generally with the large ends up stream. If not enough dead stuff is available, they cut green brush. All this material is weighted down and filled in with mud which they dig up on the upstream side of the dam.

As the water rises they add both to the height and length of the dam. The outer ends of the dam often consist of mere handfuls of mud that look as if children had laid them down in play after a shower.

If a beaver dam is broken, the beavers know it from the sound of the outrushing water. One of them is likely to appear as if to inspect the trouble, but the repairs are not made before the following night.

The amount of labor the animals put on their dam is very great. I estimated that a 250-foot dam in Itasca might be duplicated by a man with ax, pick, and shovel in four weeks, but he would have to work like a beaver.

What Does a Beaver Know?

The Indians of the early days used to speak of the Beaver People, and they had a legend that Manitou had to deprive the beavers of speech, so that they would not be as wise as the Indians themselves.

When one sees some of the things the beavers do, one is indeed tempted to assign human intelligence to

them. They not only build remarkable dams, but they maintain them and keep them in repair, not only during the warm season, but in winter when thick ice covers their ponds.

With their teeth they can cut down trees up to about three feet in diameter, although they prefer to do their lumbering where the trees run a foot or less in diameter.

A beaver pond may be over a quarter of a mile long. One that I examined in winter consisted of three sections with two intervening dams. The animals had cut their winter supply of food wood near the upper pond. There they had cut the trees into food-stick lengths, and these pieces they had floated down to the lowest, or home pond, where they had pickled the pieces in deep water near their house. By this cold-pack process they keep a supply of fresh food on hand for winter use, safely stored away under the ice in their pond.

The favorite food of beavers is the bark and leaves of the aspen, or common poplar, but they will also eat willow, birch, other brush, and aquatic vegetation; they are nearly always fat. They are strict vegetarians, and anglers often catch big trout in beaver ponds.

During the winter, they sleep a good deal, but they do not hibernate. They range freely under the ice of their pond, where they make many large air spaces by lowering the water about ten inches after the pond is frozen over. There is, however, some doubt whether the beavers effect this lowering of the water inten-

tionally, or whether it is the result of a somewhat diminished water supply running into the pond during winter.

As there are always many stumps and dead trees in a beaver pond, the ice does not sink flat down on the water; the stumps and trees hold it up in many places. In these places the water is then protected by a layer of snow, by a layer of ice, and by an air space. It does not freeze over again, and the beaver people travel about on pleasure and business as they please.

They have to watch their dam and pond in winter as carefully as the hydraulic engineer must look after his dams, spillways, and water supply.

If the water should rise too high they would be flooded out of house and home; if it should fall too low or drain away, pond and house would at once become uninhabitable; the beaver family would have to move in winter and fall a prey to hungry wolves and lynxes.

It is a popular belief that beavers always drop a tree toward the water. The fact is that trees growing near a lake or river nearly always lean toward the water and naturally fall that way without any effort on the part of the beaver.

Part IV
SUMMER

The Trail of Niagara

I

I started my walk at the place where, a long time ago, the great river began to fall over the bluffs just above Lewiston, New York. These bluffs do not look very high, until one begins to climb; but they are so steep that I could not help wondering by what persuasive gifts the old French traders and governors of Fort Niagara prevailed upon the Indians to carry thousands and thousands of packs over this most famous of all the old-time portages, which extended from the landing at the present town of Lewiston, below the wild rapids of the gorge, to the site of the old Fort Schlosser, about a mile and a half above the great falls on the American side.

It was a long portage; the distance from Lewiston to Fort Schlosser is at least seven miles. So persuasive, however, were the French gifts, goods, and liquor that a clan of the Seneca Indians soon came to look upon the transfer of goods over this portage as their vested right and tribal monopoly.

Those were lively days at the old landing place and on the portage trail, for all goods from Montreal to the Ohio, including guns, tools, and ammunition, and all peltries from the four great lakes above had to be carried over this seven-mile portage. The packs of fur weighed from fifty to a hundred pounds, but the French put up a windlass on top of the ridge to hoist

up boxes and articles that were too heavy for the backs of men.

After one reaches the top of the great ridge, the road is easy. In fact, it was a good road even in the old French and Indian days, when good roads were almost unknown; for the French soon found that they had to use carts and horses in spite of the objections of the S necas to that modern improvement in transportation.

If I had merely intended to travel over the old portage road, I could have done it in fifteen minutes, because the greater part of it is now a good auto road, all the way from the bluffs of Lewiston past Devil's Hole to the plant of the Niagara Falls Power Company, which occupies the site of the old English Fort Schlosser and of the still older French fort, known in the old days as Fort Little Niagara.

But I wanted to follow on foot the trail of the Great Cataract, so I climbed back into the gorge at the Devil's Hole.

If I had made this trip the time I first saw Niagara many years ago, I should have found the going very difficult, for the gorge of the Niagara is a chasm, an enormous trench cut straight down into limestone, sandstone, and shale rock, two hundred feet deep. It is easier now, for an electric railway has cut a trail where one can walk and look and think without every moment watching one's footing.

What almost incredible results nature has accomplished with the softest of all carving tools—the rain-drop, the running stream, the falling river. Generally she works quietly and slowly, depending for her stupen-

dous results on stretches of time so vast as to stagger the human imagination.

It has taken man a long time to learn that nature does not measure time by three score years and ten, but by scores and thousands of centuries.

An old Indian chief, hearing of the idea that the Falls of Niagara had receded the whole seven miles of the gorge, remarked, "The white men believe that the Thundering Falls were once near the old landing place at Lewiston. The white men are wrong. As far as our oldest men and their fathers remember, the falls were always in the same place."

But the Thundering Falls are receding and have receded. The story is written too plainly, there is no escape from it. Everywhere lie great blocks of limestone, fallen from the cliffs above. I passed one, almost standing on edge, which would cover an area of a thousand square feet. All along the gorge and in the rapids lie the gray blocks, toppled and tilted, split and broken, like great dots and marks in the story of the giant's trail.

II

Geologically speaking, the great turbulent stream in the gorge is a very young river. The gray faces of limestone of the upper edge stand up straight and bold like walls of masonry, and even the crumbled shale below slopes so steeply down to the roaring and plunging rapids that one has to travel on all fours, holding on to bushes and roots. If the river and the gorge were old, as rivers measure time, the slopes would



Centre of the Department of Irrigation and Civilization, Ottawa, Canada

AS FAR AS OUR OLDEST MEN REMEMBER, THE FALLS WERE ALWAYS IN THE SAME PLACE."

be much less abrupt, and the gorge would be a valley a mile or two wide like that of the Mississippi.

But the gorge is so narrow that a boy could fly a kite across it. In fact, that is what a boy did, in 1840 when the first suspension bridge was built. To the boy's kite string, the chief engineer tied a thin wire, and thus the great bridge was begun.

The gorge varies in width from about three hundred yards to a quarter of a mile, while the plunging wild river itself is only about half as wide and is even compressed into a trench of a hundred yards. Indeed, I wagered that, at the head of the second rapids, I could throw a stone across. I lost that wager, but a good baseball pitcher, I believe, could win it.

Remember, we are not speaking of a creek or branch stream, but of one of the great rivers of the world, which drains the four largest lakes of America, and gathers the waters from innumerable smaller streams and lakes. Some years ago, I camped on the most northwesterly lake that drains to the Niagara. It is a beautiful sheet of water, some hundred feet deep, set among rocks and pines on the international boundary between Minnesota and Ontario. It would take two days and two nights of fast travel by rail or steamboat from the Niagara Portage to my camp on the Niagara-Hudson Bay Portage, so vast is the area that drains over the falls and through the rapids of the Niagara.

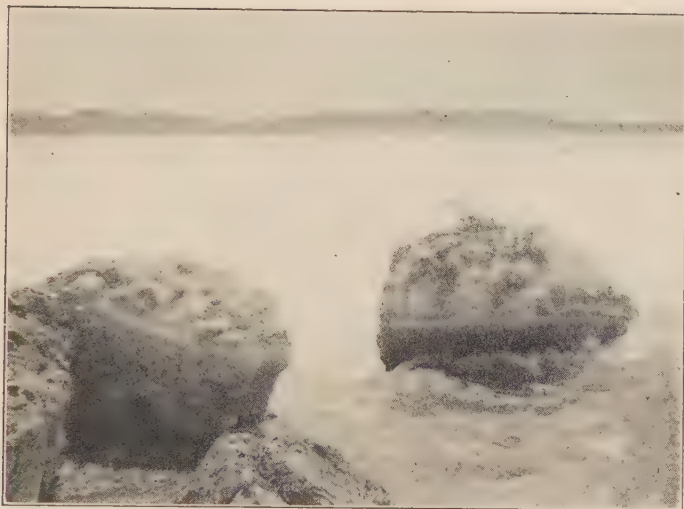
The great walls of limestone and sandstone and the slopes of red and gray shale tell of past contests and battles, but down below me the roaring, plunging

river is still waging incessant war against the rocks. Here and there a rock shows above the green swirls and white foam of the water. How many rocks are buried in the depths below, no man can know.

A great river so narrow should be very deep. At the mouth near the old Fort, where it enters Lake Ontario, its depth is about fifty feet. In the quiet stretch just below the falls, where the bold little Maid of the Mist steams back and forth, there are nearly two hundred feet of green water. In the rapids it is impossible to measure the depth, but rapids always indicate shallow water.

Above the falls on one of the small islands there is a sign, which reads; "Do not venture to dangerous places." It is a much-needed sign for humans. But those bits of life tucked away in capsules and pods, and those that sail on parachutes and tufts of cotton, heed no warning. Many perish as they travel by land and water and through the air, but some find lodgement wherever earth or rock is exposed to the sun.

Nearly all the trees and shrubs of western New York have descended into the great gorge. The purple thimble-berry and many other wild flowers, both natives and immigrants from Europe, cover the shale and hide the broken rocks with their foliage and cheerful bright flowers. In the rapids above the falls, every rock not under water is dotted with a variety of pioneer flowers, but even on the rocks over which the water races and leaps toward the great abyss, and where no human foot would dare to step, delicate bright green algæ



THE CURRENT ALMOST ROCKED IT.

have secured a hold. How these frail plants that grow like green hair on gray old scalps can get a start in such places, I do not know.

One of the rocks shown in the picture, I do not expect to find the next time I visit Niagara. It is easily identified as lying just south of the last small island, farthest up-stream from Goat Island. It seemed to me that the current almost rocked it. I had a feeling that a few floes of ice would surely push it over.

The Indians had a superstition that the great cataract demanded one human sacrifice every year, and many tragedies have been enacted, and many miraculous escapes have been chronicled in print and tradition.

On foggy nights wild ducks and geese are known to

become confused. On such occasions they probably alight on the swift water above the falls, where they become bewildered and are carried over; for many of them have been found dead below the falls.

The falls recede spasmodically. There is no visible change for years or even for decades; then suddenly a large, overhanging rock will crash into the gorge. Many such rock-falls have been recorded in the past, and they will, of course, continue in the future; for in that way Niagara Falls have receded from Lewiston to their present site.

III

On June 25, 1850, the driver of a team had unhitched his horses and was washing the wagon on Table Rock. This was a flat rock with an overhang of sixty feet. It was a favorite place for picnickers and visitors on the Canadian side. On this occasion the driver was the only man there, for it was just noon. The man became aware of a strange crackling in the rock and ran for his horses tied to a tree. The next moment the whole of Table Rock, a hundred feet long, sixty wide and a hundred feet deep, crashed into the gorge. The driver and the horses were saved, but the wagon went down with the rock. This is the largest rock-fall observed since white men lived at Niagara.

The recession of the falls has been at times more rapid than it is now. At other times it has gone on more slowly. It is now most rapid at the Canadian Horseshoe Falls, where it averages between four and five feet a year.

Ice and frost are strong factors in moving and crushing the rocks that have fallen. In 1901 an ice jam, sixty feet high, formed at Lewiston and below. Its slow movement scoured the banks and carried off everything it engulfed; some of the ice lay on the banks till July.

One may now follow the Trail of Niagara by the electric cars, and from many signs, one can form a general idea of the age of the gorge. Only one other large gorge in North America tells a similar story, the gorge of the Mississippi between Fort Snelling and Minneapolis. Neither of these gorges, as the signs of the trail have been read by trained field geologists, is very old.

The falls and the rapids of the Niagara cast a spell over the visitor. I was not tempted to go over the falls in a barrel, but I could not help speculating on the degree of danger involved in shooting the Whirlpool Rapids. It would be a foolish venture, a clear case of tempting Providence; but with a properly built boat, there would be a chance. Major Powell and his men passed safely through similar rapids in the Canyon of the Colorado. Moreover, men have ridden these rapids. Years ago, three men took a small steamer safely through the Whirlpool Rapids and the Lower Rapids.

Crossing the bridge to Goat Island above the falls, one cannot help wondering how the old settlers managed to build the first bridge to this large wooded island, which is entirely surrounded by dangerous waters, rushing, as with an uncontrollable madness,

down the sloping rocky bed to the edge of the cataract only a hundred yards off.

The old Seneca chief, Red Jacket, was much puzzled by this problem, as he watched the white men do strange things with strange tools. Finally two long square beams, heavily weighted at one end, were pushed out from a pier on land. Then a man walked along the beams, set two pikestaves firmly on the rocks and lashed the staves to the ends of the beams.

Red Jacket understood at a glance. The white man had accomplished the impossible. In Iroquois he could have made a graceful speech, but in English his vocabulary for expressing surprise and admiration was limited. Perhaps he had secretly hoped that the white men would fail to reach the island. He arose with a grunt, his eyes fixed on the beams that had been thrown over the rushing water.

"Yankees bad medicine, bad medicine!" he muttered, and he never visited the place again.

Men of the Stone Age

Archæologists in Europe have spent much time and labor studying the people of the Stone Age. Not even the Greeks and Romans ever saw men of the Stone Age in the flesh, although relics of their life and work are being found in Europe to this day.

It was in America that modern man met his long forgotten cultural ancestor in the flesh, for our American Indians were Men of the Stone Age. That one phrase tells much of their history, their great difficulty

or total inability to understand and adopt the ways of white men.

But what a wonderful ability they had developed in wresting a living from the forest, the plain, and the desert without the use of metal tools and weapons,



THEY COULD BUILD BARK HOUSES.

and without the help of any domestic animal except the dog.

I wonder how our boy scouts would fare, if they had to go into camp without their little steel axes, their jackknives, fishhooks, tin pails, and frying pans.

The Indians had none of these things. All their tools and weapons they made of stone, wood, or bone. But they fashioned their tools and weapons with wonderful skill. They could build canoes, tan skins, make

clothing and moccasins, build tepees and bark houses, make pottery. The Iroquois even cultivated small fields and built fortified villages without knowing of such a thing as a nail or steel hatchet.

To-day the Chippewas and other tribes of the North can still make real bows and arrows and bark canoes but the making of stone arrowheads, spear heads, and axes has become a lost art among them; it is as difficult for them as it is for a white man.

The old Indian villages and camps have all vanished, but the relics of their stone age may be found on all the old village sites.

Last summer a friend invited me to go arrow hunting with him on the Hudson. I had not much faith in the venture, but I went along for the novelty of the game.

It proved, however, that my friend had developed great skill in finding the old camp sites. We walked carefully up and down a recently plowed field, scanning the ground as if we had lost something of great value. In two hours, we had found a dozen flint arrowheads, among them several perfect specimens of excellent workmanship. Some had been intended for the hunters and warriors of the camp, while others, which were smaller, had evidently been used by boys to shoot birds and small game.

Our Indians had reached only the boyhood of the human race, and that is the reason why Indians always will be supremely interesting to boys of all times and of all nations.

The Orchid Family

There is a strange difference in the numbers of species that form the various families of the floral world.

The composite family, which includes sunflowers, goldenrods and asters, is the largest with 10,000 species; next in order come the orchids with 6,000; then the grasses with nearly 4,000 species, and the census closes with the hemp family of only two species.

The orchids are among the strangest and most attractive of all plants. Many of them, such as the showy moccasin, *Cypripedium spectabile*, and Noah's Ark, are so striking in form and color that no one can fail to notice them. One part of the flower, called the lip, is frequently formed into a bag, which is then the most conspicuous part of the whole plant. It is white in the showy moccasin, which is, as its name implies, the most conspicuous orchid of our eastern woods and swamps.

The large hollow lip of the flower serves both as an advertising sign and as a perch for the honey-hunting insect, which carries the pollen from one flower to another.

Very few detailed studies have been made of the American wild flowers and their insect visitors. I have found a big bumblebee in the lip of a showy orchid. I discovered the insect there, apparently in hiding, during a rainy spell of three days. When I returned to the flower the next day, it was gone, showing that it had not



IT WAS A WONDERFUL WILD MOCCASIN GARDEN.

just blundered into a trap. In spite of careful watching, I have seen only a few moths visit this conspicuous flower. Of about sixty flowers which I kept under observation for four weeks, not more than about one-half were pollinated. The others finally dried up without being visited by the necessary insect.

There are several other strange points in the life of our common orchids. The seeds are very small and their number is enormous, but the embryo plant is sent into the world without any rations of starch, fat, or sugar, for each seed consists of only a few cells. Per-

haps that is one of the reasons why seedling moccasins are very rare.

With great care I looked over a quarter of an acre of ground on which 2,500 showy orchids were in bloom. It was a wonderful wild moccasin garden with the large, vigorous flowers springing from beds of mosses and ferns and with dark-bearded spruces for a background. I had expected to find here a goodly number of seedling moccasins, but I could not discover a single one, although I searched for them on hands and knees.

The seedlings are so small and delicate that they bear more resemblance to little, leafy moss plants than to their robust, perennial parents. Many a working botanist has never seen a baby moccasin. One may indeed search a whole season in a good orchid country and not find one seedling.

The young plant is provided with a hook-like root, by means of which it pulls itself a little deeper into the muck and soil every season, until its root system has reached the level of the adult plant. How long it takes the plants to attain flowering size, I do not know, but from seedlings of various ages I estimate that it takes about six years, or even longer. Here is a chance for any observer to make valuable contributions to our wild flower lore.

All moccasin flowers are being rapidly exterminated near towns and cities, and, unless they are given effective legal protection, they will soon become extinct in many of their old haunts.

A Strange Nest

The best time to study the nests of song birds is in the fall and winter. The Audubon Societies and all individual bird-lovers have very properly discouraged the collection of eggs and birds, but to the collection of nests in late fall and winter there is no objection. The birds are through with them and will not use them again. With an occasional exception, it is true of our song birds that there will be no birds in last year's nests.

One of our finest woodland songsters, the woodthrush, exhibits a curious divergence from the rule that the smaller woodland birds conceal their nests as much as possible. The woodthrush seems to defy this common sense rule of the bird kingdom. He does not conceal his nest, but seems to do his best to make it conspicuous by attaching pieces of paper to the outside of the nest.

The woodthrush loves patches of well shaded woodland with weeds and underbrush, preferably near water. One often hears several vireos, flycatchers, and warblers in the same grove, but while it is generally very difficult to locate their nests, the nest of the woodthrush is sometimes more easily found than the nest of a hen in a barn.

What the woodthrush used instead of paper rags, before the advent of the white man, I do not know—possibly bits of curly birch bark. As far as his present-day habits are concerned, I do not remember ever having found a nest that did not show some bits of rags

or paper worked into the foundation of leaves, mud, and grass.

The most conspicuously advertised woodthrush nest I ever saw, I found near Greenwich, Connecticut, early one July. The nest was about sixty feet from the road in a small grove of natural timber, but I did not have to leave the road to find it. As my eye followed the flight of one of the birds, I saw the nest. In fact, I could not help seeing it, because attached to it were half a dozen streamers of white paper, some of which were two feet long.

The nest was placed some twenty feet up, in plain sight, on two branches of a hickory tree. After the



I SAW THE NEST.

young had left, I took the nest down, and found that the birds had used a piece of waxed lunch paper. It looked as if they had torn up a piece of it into long shreds, for the longest streamers measured exactly two feet from the rim of the nest. Many a time I saw the

dull white streamers wave in the breeze, and although frequent heavy rains passed over the region, for more than a month the paper streamers floated from the hickory boughs without visible injury.

I confess that I have no satisfactory interpretation of the streamers on the nest of this woodthrush. Perhaps facts gathered by a number of observers might solve the puzzle. What makes the meaning of these streamers so much more puzzling is the fact that two near relatives of the woodthrush, the veery and hermit thrush, conceal their nests on the ground with such expert skill that one finds them only by a lucky accident.

Poisonous Snakes

Man may be taught to make friends with nearly every bird and beast of the field and forest, with the possible exception of the big cats like lions and tigers, but between serpents and men there can be no friendship.

It may be entirely true, as Bret Harte expresses it, that snakes ask but "To lie untrodden in the sun"; nevertheless the grave danger that lurks in their poison fangs—a danger that threatens the life of every warm-blooded creature that unwittingly steps on or comes near one—places all poisonous snakes on the proscribed list, and makes their extermination desirable.

The late naturalist, John Muir, felt a kind of affection for the rattlesnakes that he found on his lone journeys in the mountains; and in climbing over the

rocks he sometimes put his hand within a few inches of the dozing reptiles without being bitten.

I have often wondered what would have happened, if Muir had accidentally put his hand on the coils of a big rattler. In that case, I fear, the world would not have seen some of the fine books with which the great mountaineer and explorer has enriched our American nature literature.

One would like to see the curse taken off our numerous harmless snakes—the pretty little green snakes and red snakes, the common garter snakes, the graceful blue racer, the noisy, bluffing blowsnake and the big, fighting bullsnakes, that are so common on the upper Mississippi.

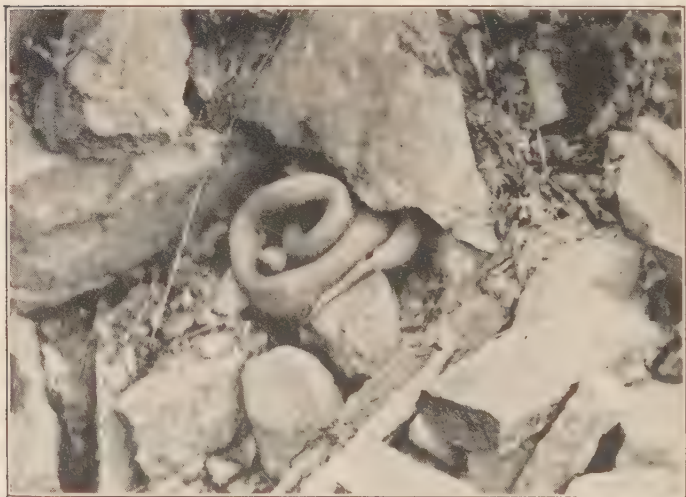
The beautiful little green snakes and red snakes I handle as freely as butterflies, and I have never seen them even attempt to strike.

But for the rattlesnakes, copperheads, and water moccasins I can entertain no friendly sentiment. Between them and men there can be nothing but perpetual warfare. They may be very interesting to scientists and naturalists, but to mankind in general they are “snakes in the grass” with whom no truce can be made.

I had often wished to see a copperhead in the open, and in the summer of 1922 my desire was gratified when I found one on a ramble in the Hudson Highlands. The creature lay neatly coiled among some brown rocks, with which its color blended most beautifully, and I should never have seen it if I had not been thinking of copperheads and looking for them.

Evidently the snake had faith in its protective coloring, for it did not move while I leisurely set up my camera within four feet of it. The common belief that a snake can spring at its victim is one of the numerous snake superstitions, but I was very careful not to place my hands within striking distance of its head.

The snake had probably lived all summer within a



NEATLY COILED AMONG SOME BROWN ROCKS.

few rods of a popular refreshment station and within a few feet of a much used auto road, but none of the natives had ever seen it.

Had it been a harmless snake, I should have quietly photographed it, and then given it a hint to take itself out of harm's way. But a copperhead I felt in duty bound to show to the natives, who promptly attacked it with a hoe and a spade. Even so, it came near mak-

ing its escape among the rocks. It was about three feet long and its bite would have been extremely dangerous.

The Dobsons

The most numerous of all animals on earth are the insects. About 300,000 of them are already known to



THE FORMIDABLE-LOOKING DOBSON FLIES.

science and new forms are being discovered every year. Many of them are so small that it is difficult to study them without a microscope or magnifying lens.

All insects pass through more or less well-marked changes from eggs to larva, to chrysalis, to the adult form. Many insects are terrestrial, but not a few of them pass a long larval stage in the water, while the adult or imago enjoys only a few days of sunshine on land. To this class belong the formidable-looking Dob-

son flies, whose larvæ are known to fishermen as hellgrammites and by many other striking names.

In midsummer the eggs are laid in chalky-looking patches, about an inch or less in diameter, and one white blotch contains more than a thousand eggs. I have found these chalky egg-blotches most common on bridges over rapid streams. When the eggs hatch, the larvæ drop into the water, where they live nearly three years and develop into most "buggy" looking creatures about two inches long. They are the terror of many small forms of life, but are in turn sought as food by bass, and are much in demand as bait by fishermen.

When the larva is ready to pupate early in summer, it leaves the water and forms a cell under stones or other objects; and after about a month the adult insect appears.

I had the good luck to find a male and female on the bank of a rapid stream in the Hudson Valley about the first of July. The long pinchers of the male are harmless as weapons of attack or defense. The female is more to be feared. She is alert and resents being handled, and her short pinchers, as I learned by experience, can draw blood from awkward fingers.

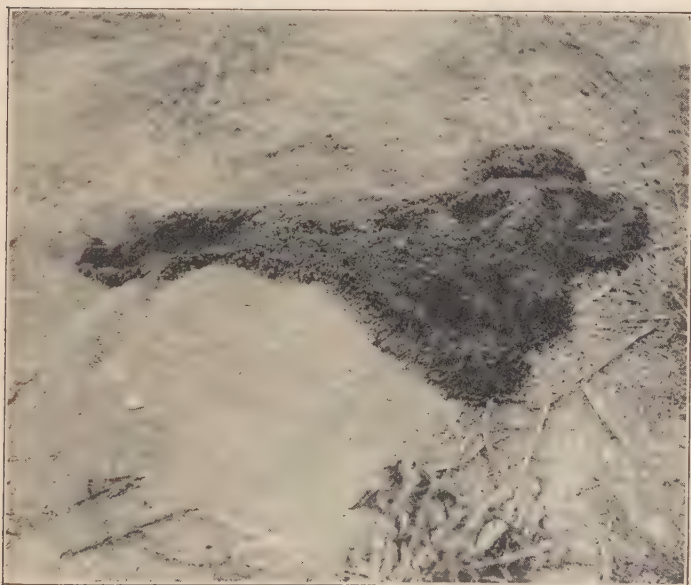
I found the two insects when they had just emerged from the pupal stage. As the day was cool and cloudy, I managed although with some difficulty, to keep them quiet long enough for my camera.

After the insects have mated and the eggs have been laid, the adults die, but the larvæ begin once more the strange round of life assigned to their kind.

The Great Cicada-Killer

I

Perhaps the greatest joy and blessing one derives from an interest in nature is the fact that one may always find something interesting, something new and unexpected.



I FOUND FRESH SOIL IN FRONT OF THE TUNNELS.

Butterflies and wild bees, wild flowers and ferns and the wild places cannot feed man's stomach, but they serve the higher purpose of feeding man's soul.

That a tennis court within an hour's ride of New

York City should be the stage for one of the strangest dramas of our native insect world was the "unexpected" in a summer vacation at Greenwich, Connecticut.

Strolling over the open space of the unused court, about August first, I noticed a number of holes large enough to admit a mouse or shrew. I poked my finger innocently into the strange tunnels, but for a week I discovered no trace of the excavator. The work seemed to be done at night, or very early in the day, for every morning I found fresh soil in front of the tunnels, but the worker never left any tracks such as one would expect of a small rodent.

In the meantime the number of burrows increased to more than twenty, and some of them showed more than a quart of excavated dirt. To solve this mystery I paid frequent visits to the grounds, and one hot noon a giant wasp, carrying a cicada, dropped in front of me. The cicada was already helpless, but its captor bayoneted it twice with its formidable sting, which seemed a quarter of an inch long.

A few days later I discovered three wasps, each dragging a cicada. The prey lay on its back and the vicious-looking hunter wasp walked astride of it, like a small boy riding a broom. In this way each cicada was dragged into one of the burrows.

Although this wasp, known as the cicada-killer, is the largest of its kind in the Eastern States, it is only about an inch and a quarter long and its body is not as thick as a lead pencil, but it needs the large burrow, so it can walk astride of the prey it drags underground. Half as large a hole would do, if the wasp would enter

the tunnel backward and pull its prey in. But as Henri Fabre and our own George Peckham have shown, the insect mind is strictly a one-track mind. It cannot break the order or change the method of its work. The cicada-killer must walk astride of her prey, and therefore she must dig a tunnel which seems out of all proportion to her size, the largest tunnel dug by any North American insect.

I caught one of the wasps in a crumpled handkerchief to see if its feet were modified for digging, like those of the mole cricket, but I could find no special structure or muscles. The wasp itself weighs only a few grains, but I estimated the soil in front of some burrows to weigh about two pounds.

The life of the solitary bee or wasp is one of the strangest in a world utterly different from our own. The mothers never see their offspring, but no human mother could work more untiringly and unselfishly for her children. Some of the wasps furnish their nests with caterpillars, others catch spiders, some catch other wasps or bees; but the big cicada-killer hunts only the singing cicada, or harvest-fly, the insect which on hot summer days, whirrs in the trees like a toy lawn mower.

II

The big wasp lays one or more eggs in each burrow, and, for each egg, at least one cicada is provided. When the eggs hatch, the grubs, or larvæ, begin to feed on the cicadas. These are fresh, for the food which this class of insects provide for its offspring is not killed, but only numbed by the sting of the hunter.

How the wasp locates the cicada, I do not know. One can readily mark the tree where the cicada sings, but it is difficult to locate the exact spot from which the sound comes, and almost impossible to catch one of the singers.

Although around the tennis court at Greenwich cicadas were so numerous that I heard them all summer, I saw only two of them. The wasps seemed to have no difficulty in finding them.

The grubs of the wasp remain in the burrows over winter and do not emerge until the following summer. How they survive the cold weather I do not know. The burrows were not closed, and the rain water had free access to them. But the ground had a sandy subsoil, so that even a heavy shower left no standing pools.

The burrows are usually placed in or near tufts of loose grass, which partly conceal the entrance; but if no cover is available, they are dug in the open. The digging is done late in the evening and during the night.

About the middle of August the cicada-killers seemed to have finished their annual hunt. Once I saw two of them enter the same burrow, and none came out while I waited. I no longer probed the burrows with my fingers, after I knew what had dug them. From one hole which I probed carefully with a weed came an angry reply. It was a loud, high-pitched buzzing, which continued for a long time without a break, but decreased very gradually in loudness. Five minutes after I had offended the wasp, I could still hear the buzz if I held my ear close to the ground.

These are a few of the things I learned about the life

of the big cicada-killer, but a great deal of her life I did not learn. What is her food during the weeks of her double life of mid-air buccaneer and tunnel digger? The amount of physical work she does is so great that she must require a large quantity of food. Does she feed on honey and pollen of the wild flowers, or does she feast on the flesh of insects?

Where does she spend the nights after hunting in the heat of the August sun? And when she has stabbed her last singing cicada, does she quietly die in the burrow that she has just provided with food for her children, whom she is never to see?

I opened one of the burrows, which was some two feet long and ran from six to eight inches underground, but I found neither eggs nor wasps, and I felt no desire to disturb any more of the subways on which the insect engineers had expended so much labor.

For four seasons I observed the strange work of the cicada-killers on the same tennis court, and although I have looked for them on many similar smooth places, I have never found them.

Wonders of the Seacoast

Some of the greatest sights on earth are found on the seashore, on the sheer endless lines where the never-resting waves of the sea beat and break upon the land day and night, winter and summer.

Those of us who live in the heart of a big continent may find it hard to realize that the sea is over twice as large as all the continents together. More than two-

thirds of the surface of the earth is covered by the salt waters of the sea, and the total shore line of the sea is easily 250,000 miles long. It would reach from the earth to the moon, or ten times around the earth at the equator.

Among the most interesting sights on the seashore and on the shores of some large lakes are the sand dunes. The most famous sand dunes of North America are those of Cape Cod, of which Henry Thoreau has given us an interesting account.

Many people have an opportunity to see the sand dunes south and southeast of Lake Michigan. The City of Chicago has made here a large park, where many strange trees, shrubs, and vines grow in abundance.

Lake of the Woods, between Minnesota and Ontario, is called by the Chippewa Indians, Lake of the Sand Hills, on account of two white hills of sand which catch the eye as soon as one enters the lake from Rainy River.

The sand dunes of Cape Henry, near Norfolk, Virginia, are visible at sea for a distance of twenty miles and are the most conspicuous feature of the coast between New York City and Norfolk. They have been landmarks for navigators since the days of Captain John Smith.

To the nature lover, sand dunes are of great interest, for they are rich in flowers, grasses, shrubs, and forms of life found nowhere else.

A Strange Creature of the Seacoast

When watching some of the creatures of the earth, I cannot shake off a feeling that they were created with the object of making men and children laugh. I have this feeling when I see gophers fighting and rac-



WHEN HE WANTS TO MAKE TIME, HE RUNS SIDEWAYS.

ing, or prairie dogs barking and tumbling into their holes.

The funniest small creature I know is the sand crab of our Atlantic coast. He has eight legs, and he can walk forward or backward, but when he wants to make time, he runs sideways. His two eyes are elevated on stalks and he keeps a sharp watch on men or animals

that approach him. If one comes upon him on the beach, he literally makes a streak for deep water.

He lives in holes in the sand, and if you try to catch him among the sand dunes, he dashes away to one of his holes, from which his two stalked eyes gaze curiously at the intruder. If he cannot quickly find a hole and you run him down, he will hastily throw a little sand over his gray body but he continues to watch you. One who is bold enough to catch him is likely to get his fingers pinched for his trouble.

I spent a most enjoyable afternoon watching the sand crabs at Fort Henry. They varied in size from that of a nickel to that of a silver dollar, and they furnished a better show than I could have found in the best movie in Norfolk.

Mother Love of a Nighthawk

The nighthawk is at home in rocky burnt-over country, along the shores of lakes, and on the flat, pebbled roofs of office buildings in all the big cities from New York and Boston to the Pacific coast.

The bird builds no nest, but lays its eggs on bare ground or on the pebbles of a flat roof. The bird and the eggs blend so admirably with their surroundings that one finds them only by accident. The eggs are almost invisible among pebbles and dry sticks.

The nighthawk depends for her safety upon protective coloration, and the wisdom of her instinct is shown by the fact that her tribe is numerous over a large part of the continent.



SHE ALLOWED MY HAND TO TOUCH HER.

A mail carrier in a city where I lived once sent me word that there was a peculiar bird sitting on the roof of a building in the business center of the town. Some tenants thought the bird must be sick or in some kind of trouble, because it was just squatting on the pebbles in the glaring sun all day long.

When I arrived with notebook and camera, the roof was so hot that no barefooted boy could have walked on it for more than a few minutes without blistering his feet. The mother bird had a problem to solve. It was to keep her two eggs from being cooked by the mid-summer sun, which blazed down on the roof through the long daylight hours for nearly two weeks during an unusually hot and dry season.

I took a picture of her from the window of an adja-

cent building. But I had much underrated the intensity of maternal devotion in the plain gray bird. She not only permitted me to use the camera close to her, but she allowed my left hand to touch her, while I worked the camera with my right hand. Finally I pushed her gently off the eggs.

Then she ran off a few yards, and while the eggs were covered by my hat, allowed me to take several pictures of her. She hissed and threatened me like a real hawk, and as soon as I left the roof she slipped back on her eggs.

After sunset her mate began to fly over the roof and utter his "paint, paint," and, when at last he passed her within a few feet, she arose and followed him.

At ten o'clock she was back on the eggs. I tried to mark her white spots with red ink to make sure that the female, as I supposed, brooded the eggs both day and night, but that much familiarity she would not allow.

Only one of the eggs hatched, and for several days she brooded the nestling to keep him from being roasted. Some days later, he began to scramble about among the pebbles. One day I looked for him at noon, when there was not an inch of shade on the whole roof. After some search I discovered him in the hollow of a piece of old tin lying on the roof. A week later he was gone, having undoubtedly joined his parents on their aerial hunt for mosquitoes and other insects.

For fully two weeks the mother had sat motionless all day in the heat of the glaring light. During the day the roof was as hot as if a fire were under it.

Everywhere, except on the small spot covered by the mother's body, eggs and young would have been killed.

The plain gray nighthawk on the roof furnished me one of the finest examples of maternal devotion among birds that I have ever observed.

The Best Wild Fruit

About a dozen families of wild fruit-bearing trees and shrubs grow more or less abundantly in North America between the Atlantic coast and the plains, from the Ohio to the Arctic region.

If the birds could take a wild fruit census, they would easily double the number of fruit-bearing trees and shrubs, because they eat everything that looks at all like a fruit or berry, no matter how insipid or disagreeable it may taste to the human tongue. Their great feast of wild fruits begins early in June with the native red elder berries. It reaches its climax during the blueberry and wild cherry harvest and does not close until the following spring, when the returning bluebirds and robins try to eke out their still meager fare of worms and insects by feeding on the dried and shriveled fruit of the sumac bushes, which has been exposed to the weather all winter long.

I would award the first prize among wild fruits to the blueberries. Several kinds of blueberries are found over a large part of the continent; they have a long season, lasting from July until September; and the crop is never a complete failure.

They have many other points of merit. One may eat them fresh, as picked from the bushes in the woods or swamp; every boy likes them in pies; mother may fill up her glass jars with them; they make excellent sauce; they are good with cream and sugar; they keep well and ship well. Several times a day, a boy, big or



EVERY BOY LIKES THEM IN PIES.

small, may eat his fill without painful results, and one never tires of them.

In the blueberry season all the dwellers of the forest, from wild mice and small birds to bears and Indians feast on blueberries.

The Chippewas, Crees, and other forest Indians perform a kind of annual blueberry migration, camping

regularly in favorite spots, and, finding new camp sites as lumbering, fire, or the growth of the forest changes the distribution of their staple fruit.

Much of the fruit is shipped to city markets. If canoeists, cruisers, and surveyors can find no blueberries, the Indians are always ready to supply them in exchange for some of the white man's sugar, bacon, or money.

If the red man's squaw is a good housekeeper, she will see to it that a goodly quantity of berries is dried in the sun and preserved for winter use. That is the way the Indians have always preserved this fruit of the forest, and provident white trappers and settlers have learned from their example.

While the blueberry crop is never a complete failure—Indians can always find some—there are lean and fat years in the great blueberry country of the north woods. If spring opens too early and a late frost kills buds or blossoms, all wild fruit suffers. The worst year I have known in the Great Lakes region was 1910. In that year the bears went into winter quarters lean, because their main fattening crop had failed.

The season of 1919 was a year of almost incredible abundance for every kind of wild fruit. Millions of acres in the North Country were blue with berries. So great was the abundance that thousands of carloads of the fruit could not be used by bird, man, or beast.

About twenty-five different kinds of blueberries grow in North America. One species, the swamp blueberry, *Vaccinium corymbosum*, has recently been cul-

tivated. It is a tall bush, from six to fifteen feet high, bearing fine large berries.

One southern species, the farkleberry, grows to tree-size, reaching a height of thirty feet; but its fruit is not edible.

The Greatest Bluffer

Many birds are expert deceivers when they believe that their young are in danger. Our plain insect-



HE HAD ASSUMED A MOST THREATENING ATTITUDE.

eating nighthawk will almost convince one that he is a real hawk and could do great bodily harm to an intruder.

But the greatest bluffer in the animal world is a

snake—the blowsnake, sand viper, or hog-nosed snake. He resembles the rattlesnake in shape and general color, although he has no rattle on his tail.

I once met a blowsnake in a piece of sandy wood and I became aware of his presence by a loud hissing noise, which sounded like a small engine blowing off steam.

When I caught sight of him, he had assumed a most threatening attitude, as if ready to strike any moment, with his head flattened almost to the width of a man's hand. I recognized him at once as the archfaker of the serpent tribe, and I sat down to see how far he would play his game of bluff.

He ceased blowing now, but I became aware of a most unpleasant odor, which lasted only a short time.

I picked up a small stick and touched him gently on the nose. I expected that he would strike at the stick, but he did not. He had a real surprise for me. He suddenly developed a severe attack of fits. He wriggled and writhed as if in great distress and, with his mouth wide open, struck two or three times at his own body. Then he turned over on his back and lay stock still, as if he were dead. As far as appearance could show, he had committed suicide. His abdomen showed a livid green, his mouth was wide agape and his black tongue lay as limp as a thread.

No snake ever looked more truly dead, but I had heard of his faking and was skeptical. I took out my watch and sat down near him. In about seven minutes, which is quite a long time when one is just waiting for something to happen, he quietly came to life again.

He turned over right side up and began to glide slowly away.

I touched him a second time with my stick, and for a second time he went into fits, but the spasms were not as severe as the first time. This time he came to after five minutes, and began to crawl actively toward the nearest bush.

I touched him several times with my stick, but he had exhausted his repertory of bluff. He didn't hiss, nor did he flatten his head; he threw no more fits. I had to be quick to catch him and drop him in a small grip, before he reached the bush toward which he was headed.

The next day I showed him to a class of teachers. He looked daggers at them and made them shriek; he coiled up and flattened his head, but his bag of gas was empty, and he would not hiss or go into fits. His only ambition was to get under cover, and I had to watch him carefully to prevent his escaping before I had taken some pictures of him. He seemed to know that the game was over.

The blowsnake is at home in sandy woods from the Atlantic to the plains, but he is not very often seen. John Burroughs knew him, but never induced him to play his whole bluff. He is entirely harmless; all his horrors are nothing but a remarkable device for self-protection.

Almost Flowers

Most of the plants that the layman observes everywhere are classed by the botanist as flowering plants. To this great division of the vegetable kingdom belong all our common trees, shrubs, weeds, and grasses, and nearly all our cultivated plants. Their flowers may not be showy, but all have some kind of flowers.

The pussies of the willow, the catkins of poplar, hazel, and alder are flowers, and the swelled buds of the maple, which may be seen plainly in midwinter, contain flowers.

To the great division of flowerless plants belong the ferns, mosses, seaweeds, and a countless variety of fungi, such as mushrooms, moulds, blights, smuts, rusts, and many others.

The ferns almost became flowers. Both wild and cultivated kinds are much prized for the beauty of their foliage, but none of them ever bears flowers or true seeds.

To the ancients and to Europeans until quite recent times, ferns were mysterious plants. Strange legends and superstitions were current about them. These quaint beliefs arose from the fact that nobody was able to discover either flowers or true seeds on ferns, although, like other herbs, they produce an abundance of green foliage.

Until a few decades ago, a belief in plant signatures was common. A plant with heart-shaped leaves was said to furnish a remedy for heart trouble; kidney-

shaped leaves, a good medicine for kidney troubles. Fern seeds, being practically invisible, were believed to make any person who carried them invisible. Shakespeare refers to this belief in *Henry IV*, Act II, Scene 1, where one of his characters says, "We have the receipt of fern seed; we walk invisible."



THE BEAUTY OF THEIR FOLIAGE.

There was a superstition, common to England and the Continent, that if a man spread a cloth or a layer of woolly mullein leaves under a fern on St. John's night and placed the seeds that fell with his money, his supply of coin would never run out, no matter how much he spent.

At the present time, ferns occupy a subordinate place

in the plant kingdom. In the tropics, some of them still grow to tree-like size, but in temperate latitudes, only their beautiful leafy fronds appear above ground; the stem always remains underground as a creeping rootstock from which new leaves are sent up every spring. A few kinds have leaves that remain green through our northern winters.

All ferns are lovers of shady woodland. The maiden-hair and Clayton's fern are common in damp and shady places almost everywhere in the northern states and Canada.

The climate of our North Pacific Coast is favorable to the growth of ferns, and between Seattle and Portland the common brake, or bracken, is an abundant weed. Ferns are not found on the open, sunny prairie, and in arid regions they are either absent or are present only as rare stragglers in moist and shady nooks.

The little brown spots and stripes often found on the lower side of fern leaves, or on special leaflets, contain spores which take the place of the seeds of flowering plants. The spores of some ferns are green instead of brown; all of them are so small that they look like fine dust.

These small bodies are detached from the fern and scattered far and wide by the wind, by birds, by animals, and by insects. When they fall on dry ground they die, but when they come to rest on moist, well-shaded earth, they begin to grow.

The spores first develop into a very small, green, flat growth of tiny *prothalliums*. This first growth of

the fern is difficult to find out of doors, but it is to be seen in greenhouses where ferns are grown. The prothalliums produce two different kinds of cells, sperm cells and egg cells. Each sperm cell swims about in the coating of moisture on the damp ground until it strikes an egg cell. The two unite to make one cell, and that single cell begins to grow.

The growth of the cell which comes from sperm and egg together makes the fern. The new fern is very small and needs from five to ten years in which to complete its growth.

The other flowerless plants have a growing process similar to that of the fern.

Milkweeds

The milk of the milkweed is not intended for consumption by man or beast. It is, on the contrary, a means of protection for the plants, like spines on a cactus and thorns on roses.

Against browsing animals this milky juice serves its purpose. Cattle and horses will eat poison ivy, but they will not touch milkweed.

Against the hosts of the insect world, however, plants seem to be as helpless as man. Insects eat every organic substance which man uses, from fruit to dyed fur, wood, and cigars, and some insect gets at every plant. No matter what poison, acrid sap, milky juice, or rosin the plant may have developed for its protection against insects, there is always some insect which finds a way to rob it.

Sometimes insects seem even to make fun of the protective chemistry of plants by specializing on the very plants that have produced a violent poison or a highly disagreeable substance. The potato bug will touch nothing but plants of the nightshade family which produce the poisonous drug, *solanin*. The caterpillars of the very common monarch butterfly specialize on milkweeds. Both of these insects will starve to death in the presence of lettuce or cabbage, of celery, clover, alfalfa, or any other green plant on the wide earth. But they know how to find their own chosen plants in swamps, woods, and desert, as well as in fields and gardens.

About eighty plants of the milkweed family are native to the United States and Canada. Most of them have broad leaves, but a few of them have narrow grass-like foliage. One of the narrow-leaved species grows among the short buffalo grass and blackroot grass of the Bad Lands. My eye would not have discovered these small plants if the gold-dotted cocoons of the monarch butterfly had not been attached to them. The butterfly, searching for milkweeds on which to lay her eggs, must have discovered them by scent, for the vision of insects for things not in motion is not nearly so good as that of human beings.

The flowers of most milkweeds are strong-scented, and they produce nectar in such abundance that they attract swarms of insect visitors. Butterflies, moths, wasps, honeybees, and even mosquitoes enjoy the overflowing cups. But the milkweed is a treacherous host. Honeybees, and smaller visitors sometimes get their

feet caught on little dots of glue by means of which stronger insects pull the waxy anthers out of the flowers. Weak insects, including some honeybees, are thus occasionally held prisoners until they die.

On the feet and legs of vigorous honeybees, wasps, and butterflies one can nearly always find the saddle-bag-shaped anthers of milkweeds. The active and high-strung bumblebees must have found this annoyance too much for their temper; at all events, while they search vigorously for nectar in many kinds of flowers, wild and cultivated, they absolutely ignore invitations to the milkweed cups.

Weed or Flower?

According to the name which the old Greek naturalists gave to one of its relatives, our giant ragweed ought to be classed as a flower. I suspect, however, that the Greeks applied the name *ambrosia* in irony, for all the plants of the genus are of a coarse texture and bitter taste.

Cattle and sheep do not eat ragweed, but lazy fat horses will stop to munch ambrosia tops when the farmer tries to make them turn quickly at the end of the cornfield. In the pasture no horse touches a ragweed.

The great Swedish naturalist Linnæus, the father of our scientific nomenclature, applied the beautiful name of *Ambrosia trifida*, three-lobed ambrosia, to our great American road-side weed. In early summer the ragweed is really a magnificent robust foliage plant, which



THE RAGWEED IS A ROBUST FOLIAGE PLANT WHICH
COVERS WASTE PLACES

covers unsightly waste places and shows the nature lover where skunk and woodchuck have been digging their burrows.

In autumn and winter the tall stalks, reaching a height of ten to seventeen feet, look gaunt and ragged.

Now the thickets of dead stalks catch the drifting snow, so that the little four-footed sleepers and earthworms and insects will not be touched by the cold blasts of winter.

Although the ragweeds do not display any showy flowers, they disperse great quantities of golden pollen, and their pungent odor is inseparable from the invigorating air of autumn. Their fruit never furnished ambrosia for the gods, but the numerous seven-pronged nutlets do furnish rich meat to many seed-eating birds, and to thousands of wild mice, who seek their winter food in safe tunnels under the snow.

I have never found a bird nesting on a ragweed, because the plants generally grow in thickets and jungles. Like close-growing forest trees, they drive one another to seek the light, and they have no room to branch, as do the big wild thistles on which the goldfinches often build their nests.

The ragweed is an annual. In autumn, the whole plant dies, including the root, and in spring the plants must all start anew from seeds. Each seed weighs only a few grains, but so vigorous is the growth of the young plants that in a growing season of about one hundred days, some of them attain a height of seventeen feet, which means an average growth of a little more than two inches a day.

We generally associate weeds only with hard work in garden and fields, but these vigorous plants have their own place in the household of nature. Long before man plowed and cultivated fields they helped prepare the earth for his coming. Most of them are beauti-

ful during their growing season, and a world without weeds would be a barren desert.

The giant ragweed grows in suitable places from the Atlantic Coast to the Rocky Mountains.

An Indian Orchard

It does not seem to be generally known that many Indian tribes of North America practiced agriculture before the coming of the white man.

The famous Iroquois in New York, the Southern Indians, and even the Mandans on the Missouri River in North Dakota, raised large quantities of corn, squash, melons, and beans.

I do not know if any Indians north of Mexico originally cultivated fruit trees, but the Iroquois planted many which they received from the early Dutch settlers on the Hudson. The Sioux and Chippewas used only wild fruit.

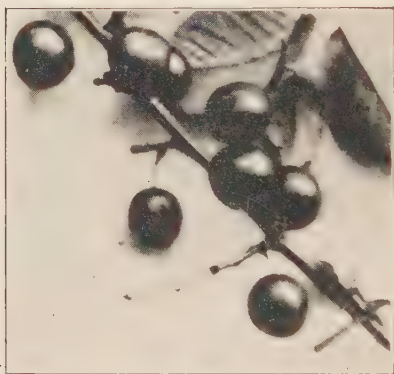
One year I lived in a cabin near an old Chippewa camping ground at the head of the Big Fork River. With a little practice I easily located the old Chippewa camp sites. They are always at good canoe-landing places, on wild rice lakes or near good hunting grounds; many lie along the old fur-trading routes.

They are overgrown only with grasses, herbs, and low bushes; for the ground is packed hard by the walking and dancing of many feet. A deserted Indian camp will resist the invasion of forest trees longer than a deserted New England farm.

The Chippewa camping ground on the Big Fork

was enclosed on three sides by the most remarkable wild orchard I have ever seen. All the native fruits of the Chippewa country grew there in profusion. There were chokecherries, pincherries, June berries, thorn apples, high-bush cranberries, wild grapes, and plums.

Of course, none of these fruits had been intentionally planted by the Indians. The women had cleared



CHIPPEWA RED.

land for them by cutting the forest trees for camp wood, and had thrown the discarded seeds and pits of the fruit they ate into the brush.

This wild orchard contained four well-marked varieties of wild plums. One large yellow kind was sweet and mel-

low about August 10. Then came in close succession two beautiful dark red varieties with small globe-shaped fruit of fine flavor. They were ripe about August 15. I called one of these Chippewa Red, after the Indians who planted it by accident.

The fourth, a small variety oval in shape, I called Chippewa Hard. The trees bore so profusely that I counted about 250 plums on one small branch. What their flavor and texture is when they are ripe, I did not learn; for when I broke camp, about August

20, they were still as tart as green persimmons and nearly as hard as marbles.

If any horticultural society should ever want to find a variety of wild winter plum, I believe the Chipewa orchard on the Big Fork could furnish a good original stock.

Sea Gulls

The most conspicuous birds along our Atlantic and Pacific coasts, and on the Great Lakes from Buffalo to Duluth, are the sea gulls, known to ornithologists as herring gulls.

On every coast, in every inland port, the large birds in their snowy white and pearl-gray plumage are a familiar sight. Incoming and outgoing vessels are accompanied by them for days.

Powerful flyers they are, and graceful swimmers, riding high and buoyant on the waves like Indian canoes. But they are not divers and fishermen, like loons and cormorants and many other birds. In spite of their immaculate plumage, they are scavengers.

Everything of fish or animal life cast up by the waves, and the offal from the fisheries, is food for them. Every kind of kitchen scrap thrown overboard by ships, bread or pancake, meat or pie, is eagerly devoured unless it sinks before they can seize it.

In late summer or fall a number of brown birds are associated with the white flocks. These are the young of the season, who are just entering upon the free and hardy life of the sea.



THE MOST CONSPICUOUS BIRDS ALONG OUR COASTS.

In the spring migration they pass northward over the large rivers on their way to a number of large inland lakes. At Chicago I have seen them in mid-winter resting on the ice near open water.

Like most sea birds, when their nesting time comes, they resort to uninhabited rocks and islands, where there is no sound of human traffic, but only the song of storms and waves.

Among their favorite homes on the Great Lakes are the Siskowet Islands in Lake Superior, two hundred and fifty miles from Duluth. On these long islands, which rise from the lake like gigantic whalebacks, hundreds of nests may be found in May and June. The nests are built of rubbish and a few feathers, and are placed on the rocks just out of reach of the waves.

A fisherman rowed two lads and me to the islands, and left us there for the day, for the Siskowets lie just south of Isle Royale, far off the usual course of Great Lakes steamers. There was a spice of adventure in the trip, because in case a storm came up the fisherman would not be able to call for us that evening.

The nests were not hard to find, and the eggs, half as large as hen's eggs, and decorated with dark brown spots on buff, were objects of beauty.

Odd-looking, downy gull chicks, pale brown and curiously mottled and spotted, but not at all resembling their parents, were running everywhere, or hiding among the rocks and drift rubbish, where they became almost invisible. The parents sailed close over our heads and screamed as only sea gulls can scream.

By means of baiting the old birds with fish offal or focusing the camera on a favorite spot and then springing the shutter by means of a long rubber tube, we took some choice photographs.

A United States army captain once saw a herring gull shoot the Whirlpool Rapids below Niagara Falls. The bird seemed to swim deliberately into the plunging waters. Again and again it was completely submerged; then it rose on the crest of a wave and shook its wings, only to be submerged again. The captain and many other people watched the bird from a car of the Gorge Railway, which runs along the rapids. At the foot of the rapids the bird took wing and flew away, none the worse for an adventure which no human swimmer has ever accomplished.

The Game of Camping Out

Camping is not a game for babies or for those that cannot be happy without all the frills and coddling luxuries of town and city life. It is a fine game for real boys and girls and for grown-ups in whom some of the spirit of youth is still alive.

I know a Chicago man who goes camping in a St. Paul hotel. He says it refreshes both his body and his soul, because when he feasts his eyes on the green hills and gleaming waters of the Mississippi, his responsibilities drop away and he becomes a care-free traveler in a foreign land.

"But the Mississippi is just filled with water, the same as Lake Michigan," I ventured to argue.

"Yes, true, but it is water in a different scenery," he replied.

And these words suggest the essence of camping—freedom from care, a change of scene, and a change of activity.

There are many different kinds of camping. To live near wood, field, and water, and have some one else cook your meals is a mild form of the game. To live in a shack or cabin and to attend to all your wants yourself brings you much nearer to the joys and benefits of camp life. But if you would play the fine game for all there is in it, you should break away from wooden walls and board floors and live in a tent. To camp in the shade of a tree and sleep under the open sky would bring one still closer to Mother Earth and

open air; but that is not a practical method of camping east of the plains.

The most important article in the camper's outfit is a good mosquito-proof tent. The selection of a tent, like the choice of food and clothes, is to some extent a matter of personal taste. I prefer a seven-by-nine wall tent, made of silkeline or balloon silk, with a two-



A WALL TENT MADE OF SILKALINE.

foot sod cloth sewed all around the bottom of the tent. To one of the front flaps should be sewed a strip of cheese cloth or mosquito netting a yard wide and two feet longer than the height of the tent. A tent of this kind, with a half-inch rope, forty feet long, weighs about ten pounds and can be set up by one man.

It can be rolled up small. It is very strong, and sheds the rain as well as the much heavier tents of



THE FINEST GAME ON EARTH.

duck. It is large enough for two men and all their duffel, and if necessary four men can sleep in it. It is much more roomy than an A tent or a pup tent of the same dimensions, especially in wet weather. For it must be remembered that during a rain everything in contact with the inside of a tent gets wet, no matter how well the tent sheds the rain.

No tent poles are needed unless one travels by auto, and is likely to camp where trees are not available; but the gable should be provided with loops. The rope, pulled through the loops, is either tied to two trees or to one tree and then run over a forked pole.

In the well-drained country of the New England and New York hills one may often disregard protection

against mosquitoes, but in the states and provinces touching on the Mississippi and the Great Lakes, protection against mosquitoes at night is by far the most important essential of an enjoyable summer camp.

If one intends to camp in a log cabin, he should carry a bobbinet tent to suspend over his bed, for the ordinary log cabin is not mosquito proof and cannot be made so.

In all of North America, the mosquito is the only wild animal dangerous to the peace and happiness of the camper. A tent not provided with a sod-cloth, a mosquito screen, or an inside sleeping tent is not worth taking into the woods.

A man who spends his night in fighting mosquitoes instead of in sound sleep will think that the finest game on earth is nothing but a sad delusion.

He is likely to start for town not later than the third day with a tale of hardship for wife or mother, by which he tries to conceal his defeat.

It is only the ill-prepared novice who roughs it with the mosquitoes at night. The experienced camper does not mind a few pests in daytime, but he sees to it that not a single mosquito shares the tent or cabin with him at night.

Essentials of Camping

A few more words must be said about protection against mosquitoes and biting flies. Fortunately no flies work nights. When the tent is not in use it should be kept closed. But in spite of all precaution some

mosquitoes will enter. These can be killed most quickly and surely by burning them with a lighted candle. There is no danger of setting the tent on fire.

Before the straggling mosquitoes are disposed of, the free side of the mosquito bar should be fastened with safety pins to the tent flap, which need not be closed. In this way the camper has plenty of fresh air. It pays to do all this work with great care. Half a dozen hungry, singing mosquitoes will spoil a night's rest. If an opening an inch square is left, the tent, in a bad mosquito season, will soon be filled with hungry buzzers.

Duffel or poles must be used to hold down the sod-cloth and the lower end of the mosquito netting. It will pay the novice to make at least one trial set-up of his tent at home. It should be said again that the camper who spends the hours, precious for sleep, in feeding and fighting mosquitoes does not know the first rudiments of the game.

A man who sleeps well will enjoy himself; the man who does not is a sad example of incompetence.

The several fly and mosquito medicines are all of some value in the daytime, but are useless at night. A head-net offers protection, but it is very hot and cannot be worn at night.

The worst fly and mosquito season is in the months of June and July, but that is the time when the fish bite best, when the birds sing and the wood flowers are in bloom, and when all nature appears at its best.

In August flies and mosquitoes begin to disappear, and by the first of October they are gone. Some mos-

quitoes, however, are likely to be present during the whole period of warm weather unless the season is very dry.

A party of two should take at least three tin pails of different sizes so they will nest, a water pail or folding bucket, two frying pans, a folding lantern with



CAMPING KITS ARE BEST CARRIED IN PACK-SACKS.

plenty of candles, a sharp half-ax with a handle long enough for a good swing. This is the most important tool in camp, and its blade should be provided with a case. A file or whetstone is desirable to keep the ax sharp.

An oil-burning lantern is a great nuisance. A small folding ax is little better than a toy, but a boy scout jackknife is very useful. Firearms are only a source

of danger in a summer camp, but fishing tackle is, of course, necessary.

Old clothing and several pairs of old shoes in good repair serve the camper's purpose well. Wearing heavy boots all day long is equivalent to carrying a ton of coal to the top of a ten-story building.

The usual night gown or pajamas and a small pillow, a pair of clean sheets, plenty of soap, and, for a man, a shaving outfit, I consider essential. Only the novice goes in for roughing it; the old hand makes himself comfortable, but carries no useless luggage. A rubber blanket is desirable, but a rain-coat is generally not worth carrying. Blankets, food, towels, and miscellaneous duffel are best carried in pack-sacks.

The easiest way to travel is by boat or canoe. A canoeist should be able to swim, and a white man's canoe should have seats. It is much steadier than an Indian birch bark. On the selection of foods, and other details, any good book on camping furnishes the necessary information.

Dangers from snakes and wild animals in the northern states and Canada are purely imaginary. The mosquito and the toothache are the only real dangers. See your dentist before you go camping. A boy scout emergency kit contains all the necessary medicine.

For bedding, grass, brush, boughs of balsam, spruce, and hemlock are good materials. A sickle saves much time in cutting grass and brush.

When you go on a camping trip be sure to take along plenty of paper and stamped envelopes as there will be a great deal to write to your parents and friends.

Some Rules of Good Camping

Summer campers, students on trips, and outers from the city often disregard the rights of others. By doing so they give themselves a very poor testimonial of character and manners. Taking cultivated fruit, vegetables, eggs or chickens, or anything of value without the owner's permission is everywhere and at all times just plain stealing.

The first business rule of all camping and outing is cleanliness, which here means cleanliness in all things. To leave a picnic or camping place littered with rubbish, paper, boxes, or fruit peelings, stamps the people who leave it as ill-bred, thoughtless, and inconsiderate of the rights of others, and may make the most beautiful spots unsightly and disagreeable to the next comer. Do not defile the fair face of nature. Leave your camping or picnic place as clean as you found it.

All rubbish should be burnt or buried. Paper, boxes, offal of fish, or scraps of lunch must not be thrown into streams or lakes.

Cleanliness in all things is also of the utmost importance for the preservation of health. If filth, offal, and excrement are not burnt or buried, the flies will crawl over and feed on these things, and the next minute or hour they will crawl over somebody's food and leave on it filth and the germs of disease. Truly, cleanliness is next to godliness.

It is wrong to put pieces of bread and other food in the fire. If it cannot be taken home for human

food or saved for chickens or animals, it should be placed where some wild animal can find it.

All gates and bars must be closed and no fences should be broken or cut. If a gate is left open or a fence broken down, cattle and hogs may get into a field and do much damage.

A decent, thoughtful camper observes certain rules about his campfire. He never cuts or hacks live trees. For fuel he uses only dead and waste wood. He never builds a fire against a tree, alive or dead. The fire should be built at some distance, about ten feet, away from any tree; the tree then makes a convenient back rest for the camper.

The greatest care is necessary to prevent a campfire from running through woods and over meadows. In a dry season and on a windy day, it is best to build no fire at all. One should never build a fire on peaty soil. Peat will smolder for days and weeks, and a strong wind may at any time fan the hidden fire into a destructive blaze.

No campfire should be left burning. Irrespective of place and season, it must be put out with water or covered with earth, but not with peat.

It is a very good precaution to be vaccinated against smallpox and to be inoculated against typhoid before going on a camping trip.

APPENDIX

Teachers agree fairly generally that field trips are the most successful form of nature-study teaching. Direct observation of plant and animal life forms the soundest basis for attaining the aims and securing the true values of the subject. In order that the student may best accomplish the purpose of outdoor study, keen and patient observation is necessary. Below will be found some suggestions on field work which will help the inexperienced student.

The questions which follow the general suggestions are intended rather to stimulate the reader's interest and to offer exercises for his powers of reason and observation than to test his knowledge of the text. They may be used for oral or written discussion.

SUGGESTIONS FOR OUTDOOR NATURE STUDY

The many excellent tree guides and flower guides which are now accessible to everybody make it easy for the beginning nature student to become familiar with the trees and flowers in his neighborhood by looking for them outdoors during the spring and summer. After he has learned to recognize them in foliage, it is not difficult, and is interesting, to study them in their winter condition. There are very few unknown flowering plants left in the United States and Canada, but of only a few of the most common plants is the complete life history, from seed to maturity, known. Every observer in the field can discover many facts which nobody has yet known.

All the birds of the United States and Canada are known, and almost all the mammals, reptiles, and amphibians have

been studied, but our intimate knowledge of the life histories of birds and animals will never be complete, for nobody ever gets more than a glimpse of the life of a wild creature in his natural environment. Birds and animals have many individual peculiarities, and their habits are to a considerable extent modified by the locality and the environment in which they are living. Every one can see and hear sights and sounds which have never been seen or heard before. I shall mention just one example of this kind: The mink is a common animal over a large part of North America, and several thousand young minks are born and play near their nests every year, but only once in my life have I had an opportunity to watch three young minks at play, and there are very few persons who have seen them at all.

One sees most of the intimate life of wild things when he goes alone to watch them, and two or three persons walking quietly along a trail will see and hear much more than a large group. A noisy crowd will see no wild animals and few birds.

To observe birds and animals, one should, if possible, approach them with the light behind him, and it should be remembered, that the larger wild animals are very shy and can be approached only up the wind. When the wind blows towards the animal, he will catch a man's scent while he is still half a mile away and will quietly disappear before he is seen. Opera glasses and field glasses are desirable aids to the study of birds and animals, but they are not entirely necessary. Finding and recognizing the different kinds of wild things in the woods is much more fascinating than studying them from pictures and museum specimens.

In trying to approach a bird or animal, one should not walk directly toward it. Passing a creature and walking around it in a spiral generally enables one to make more

satisfactory observations. Often it is best to sit still in a good place and wait for bird and beast to call upon the visitor.

The student who wishes to accumulate precise information about outdoor life in any region should keep a notebook and write down what he sees, always giving date and place. Memory is not to be trusted. A few years after an observation has been made, the observer is no longer sure whether he saw what he did in June, July, or August.

Readers who would like a somewhat detailed guide for watching the procession of birds, insects, and flowers through the seasons will find material of interest in Ernest Ingersoll's *Nature's Calendar*. The book is especially adapted to the vicinity of New York City, and in using it at other latitudes it is important to remember that the seasons advance at the rate of about thirteen miles a day, or 400 miles a month, over the United States. This means that, in general, if warm spring weather begins about New York City the first of May, it would begin in the latitude of North Carolina about the first of April, and in that of southern Georgia about the first of March.

Applying this reckoning to the Mississippi Valley, February at New Orleans corresponds to March at Memphis, to April at Omaha, and to May at St. Paul and Minneapolis. On the Pacific Coast there is a difference in the seasons of about three months between the regions of Puget Sound and Southern California. It must not be forgotten that these statements are true only in a very general way, and that allowance must be made for altitude as well as for latitude.

Photographs add greatly to the joy of walks and camping trips. One can take interesting pictures with every kind of camera, from the little box camera up to the most expensive equipment on the market. No one camera is adapted

to every kind of outdoor work. Perhaps the best for amateurs is a postcard-size kodak with as good a lens as one can afford to buy.

Interesting observations on insect life can be made everywhere—in one's back yard, in the garden, in the field, in the woods, in the water, and in the desert, but it should be remembered that the insect world is not our world, and that insects are almost entirely creatures of fixed habits and instincts.

The waters of North America are usually rich in fresh-water fish, far richer than those of Europe. They can be watched by the patient observer, and pictures of them are interesting in any collection. Pictures of fish should never be taken with the fish strung up on a line or on a pole with their mouths gaping wide. Pictures of that kind are ugly, and too often they suggest the waster of fish life rather than the legitimate sportsman.

Even creatures lower in the scale of life than the insects have interesting life histories. Worms and clams, for instance, play their own quiet dramas of life and fill their own places in the scheme of natural things. One can truthfully say of the life of plants and animals what Goethe said of human life, that it is interesting wherever one takes hold of it.

SUGGESTIONS FOR FURTHER INVESTIGATION, STUDY, AND DISCUSSION

PART I

1. What stream flows near your home? Where is its source? Where does it end? How could you best explore it?
2. Do red squirrels hibernate? Do squirrels ever fall out of trees? When and where would you find baby red squirrels?
3. Which are some of the most common wild flowers in

your region? In August, the purple loosistrife covers miles of low land along the Hudson.

4. Do you think it is right to cut down a bee tree? Why? What other creatures, besides bees, live or nest in hollow trees? Can you find out what causes a tree to become hollow?

5. When do robins and bluebirds return to your region in spring? How late do you see them in fall? What birds are with you all winter?

6. Why must bears hibernate in the Northern States? Can you find out if bears in Florida hibernate?

7. Why are there more wild ducks in fall than in spring? What has caused the great decrease in water fowl? Try to find a bird roost in your region.

8. What birds gather in flocks in your neighborhood? Do you know of any blackbirds that nest on trees?

9. At what season are mushrooms most abundant? On what do mushrooms live? Dig up some mushrooms and look for the tangle of underground threads, called the mycelium.

10. Try to find the nest of sunfish in early summer. Why are not all our rivers and lakes filled with fish, when fish spawn thousands of eggs every spring? Try to visit a fish hatchery.

11. Try to find, in spring, the eggs of salamanders. Do salamanders ever call or croak as frogs do? Try to find salamanders in their winter quarters.

12. Can you find any reason why gray squirrels become tame so much more easily than red squirrels? Do gray squirrels raise one or two broods a season? Are they ever destructive to birds? Do gray squirrels render any service to the forests in which they live?

13. Is the porcupine of any benefit to the forest? Ask woodsmen and trappers if the porcupine is ever eaten by other wild animals.

14. What wild berries remain on the bushes over winter in your region? Which is the most beautiful? What birds eat those berries?

15. Do you know of any plants besides wild hemp that

have escaped from cultivation? Do you know of wild flowers and weeds that have come to America from Europe?

16. Why is the skunk still common over a large part of North America? Where are the skunks in winter?

17. Did the continental glacier extend over your home region? How can you tell?

18. Make a list of winter berries in your neighborhood. Do some real scouting to see which birds eat them.

19. Scout for coon tracks on soft ground and for toe marks on trees, if there are any coons left in your region. Do not disturb a coon tree, if you find one.

20. Answer by personal observation, if possible, the old question, whether woodchucks climb trees. Try to dig one out in fall, but put him back in comfortable winter quarters.

21. What causes a tree to die? What are the biggest trees in your neighborhood? Estimate the number of leaves on some big tree and the area they would cover.

22. Visit a piece of woodland after a storm—after a sleet storm, if possible. Why are apple trees not planted close together?

23. Try to find out why rabbits and mice nearly always cut the vines of the moonseed, but do not touch the vines of the bittersweet. What other wild vines or shrubs do mice and rabbits not touch?

24. Scout for the sleeping places of crows, robins, nut-hatches, chimneyswifts, woodpeckers, sparrows, or any other birds.

PART II

1. A good nature scout can find frogs in winter. Can you find them?

2. If you are a first-class nature scout, you can find a few wasps in winter. Look carefully under dead leaves in woods. You must search as if you were looking for a lost diamond.

3. Scout for the glistening slime tracks of slugs early in the morning. Try to find slugs or land snails late in fall.

4. You might write or tell any fact of interest about Brer Rabbit. If you have not done so, read the Uncle Remus stories, by Joel Chandler Harris.

5. Find out about how many deer there are in your state. Why is the sale of venison prohibited? If possible, study the different kinds of deer in some large zoo.

6. If there are any foxes in your region, follow a fox track on the snow for an hour or two and try to learn what the fox did.

7. If possible, do some scouting for muskrats when the ice on ponds and sloughs is clear. How can a muskrat breathe under the ice?

8. Read what Audubon and other bird students have to say about the bald eagle and the golden eagle. Study them in a zoo, if possible.

9. Do birds and animals learn by experience? Bald eagles are still occasionally seen in the Hudson valley. Several pairs nest near Lake Superior and they are common on the coast of Alaska. Why should nobody shoot an eagle?

10. Why should such flesh-eaters as coyotes, foxes, minks, and weasels not be exterminated?

11. Read Inman's *The Old Santa Fe Trail*. Study the different breeds of cattle at a state or county fair. Study buffaloes and other wild cattle in a zoo.

12. Read Shaler's *Domesticated Animals*. Why are the Indian ponies not as large as the Spanish horses from which they have descended?

13. Scout for seeds of trees and other plants that are distributed by the wind. By squirrels, by dogs and farm animals, and by birds.

14. Do elms and maples store their seeds? Where are the seeds of the burdock kept over winter?

15. Why should fires not be allowed to run through the woods? Examine carefully a piece of woods that has been burnt over.

16. Learn the chickadee's long distance call. It consists of two clear whistled notes. Scout for other winter birds.

17. Why are many winter birds fond of suet? Suet must not be put in a wire screen. Why not?

18. Scout through the woods for trees struck by lightning. What is the effect of fire in the woods?

19. Scout for mink tracks along an open stream in winter. Why should mink and other fur bearers not be caught in the summer season?

20. Send to the Department of Agriculture, Washington, D. C., for pamphlets on "Fur Farming." Visit a fur farm, if possible.

21. How would you account for individual peculiarities in trees of the same species? How many different kinds of trees can you find in your region?

22. Do you think that old hollow trees furnish an element of picturesqueness that should not be destroyed? Try to see some wild birds going to roost.

PART III

1. What is the earliest spring flower in your neighborhood? What insects, if any, do you find on it?

2. Remember and spread the motto: "A wild flower looks most beautiful where it grows." What wild flowers in your region should not be picked?

3. How many kinds of wild violets can you find? You might try growing wild violets from seeds.

4. Try to find some seedling orchids. Scout for insects visiting orchids.

5. Try to induce quails to come to a feeding place in winter. They will eat small wheat and cracked corn and seeds from the hayloft.

6. Try to tame some chipmunks. Read what John Burroughs and Ernest Thompson Seton tell about them.

7. Look up in some book on zoology, where the opossum belongs in the scheme of nature.

8. Try to find out about the life history of the European cuckoo.

9. What does this article suggest as to the length of time it takes for the instinct of a bird to be modified?

10. Make a list of the dates of arrival of about twenty or more birds in your town or district.

11. Look for angleworms in a wild country. Scout for angleworms after a spell of dry weather. You are a good nature scout if you find any.

12. What animals and birds scatter the seeds of forest trees? Have you seen them do it?

13. Why must we stop burning over woodlots, forests and waste land?

14. On what trees can you find the little holes of the sap-sucker? Watch for sapsuckers coming to the same tree in spring year after year.

15. Do robins and other birds return to the same neighborhood every year? How can you tell?

16. Do turtles have teeth? How many different kinds of turtles do you know? Read William Beebe's account of the giant turtles of the Galapagos Islands.

17. Of what use are the horns to deer, moose, elk and caribou? Do you think it is of any advantage to them to shed their horns every year?

18. When you hear a flock of noisy jays or crows, try to find out what the noise is all about. Do birds find their food by sight or by scent?

19. If possible examine a beaver dam carefully. Do you know of other animals that build houses or nests? Call at your public library for an account of the life of beavers. What animals that you know of have some mechanical ability? What animals burrow in the ground?

PART IV

1. Consult at a library the account and the maps published by the United States Geological Survey on the falls and the gorge of Niagara.

2. Examine Indian relics in a museum. Read Fiske's *The Discovery of America*.

3. Do some botanical scouting for different kinds of orchids in your region. Watch for insects on these orchids.

4. How can you distinguish the songs of the woodthrush, the veery, the hermit thrush and the thrasher? It takes patience to scout for bird songs. Scout for their different call notes.

5. Is there a good reason for killing a harmless snake? Would you always kill a poisonous snake?

6. Scout for the eggs of the Dobsons in June and July. Do some scouting for other aquatic insects.

7. Scout for this remarkable insect from the middle of July to the middle of August. Look on tennis courts not in use during that time and on other warm bare soil. The cicada-killers are not common, and any one finding them makes a real discovery. Look also for other burrowing wasps.

8. Visit a region of sand dunes, if possible, and after your visit ask for a book on sand dunes at the library.

9. Visit the seashore, if possible, and then ask at a library for a book on shore life.

10. The nighthawk and the whippoorwill are not the same bird. Try to find the eggs or young of either.

11. Do you think blueberries are the best wild fruit? How many kinds of edible wild fruit can you find?

12. If you ever find a blowsnake, check up your observations against those of the author and see if they agree.

13. How many different kinds of ferns can you find? Do cattle eat ferns? Can you discover a way of raising ferns from spores?

14. A good nature scout can find the anthers of milkweeds on the feet of butterflies, moths, bees and wasps. Check up the author's remarks on bumblebees and milkweeds. Look for milkweed caterpillars. Is insect fertilization a success in milkweeds, or is the device too complex? Go to the milkweeds for an answer, not to books.

15. Look for the flowers of ragweeds, if you are not subject to hay-fever. What other plants produce a great abundance of pollen?

16. If possible, check up what the author has to say about Indian camping grounds. What animals might eat wild plums and scatter the stones?

17. How can a gull turn this way and that, up and down without moving its wings? What other sea birds do you know? Do you know the scream of the gulls? Do any water birds sing?

18. What useless things did you take along on your last camping trip? What things did you want that you had not taken? Make a list of six books that you would take along on a camping trip.

HELPFUL BOOKS ON OUTDOOR SUBJECTS

- BURGESS, Thornton W., *Animal Book for Children* (Boston, Little, Brown & Co.).
- HORNADAY, William T., *The American Natural History* (New York, Charles Scribner's Sons). A readable and reliable account of mammals, birds, and reptiles.
- JORDAN, David Starr, *Manual of the Vertebrates of the Northern United States* (Chicago, A. C. McClurg Co.). A handy field book.
- MOSELEY, Edwin L., *Our Wild Animals* (New York, D. Appleton & Co.). A simple and interesting book about North American mammals.
- PRATT, Henry Sherring, *Vertebrate Animals of the United States* (Philadelphia, P. Blakiston's Sons & Co.). Includes nothing about birds. The most recent and complete guide of its kind.
- SETON, Ernest Thompson, *Life Histories of Northern Animals* (Garden City, Doubleday, Page & Co.). An excellent account of the life histories of most of our common animals.
- STONE, Witmer, and CRAM, William E., *American Animals* (Garden City, Doubleday, Page & Co.).
- The Journal of Mammalogy*. Published quarterly at Washington by the American Society of Mammalogists. Devoted exclusively to the study of mammals; the only magazine of its kind in America.
- BAILEY, Florence Merriam, *Handbook of Birds of the Western United States* (Boston, Houghton Mifflin Co.). The standard guidebook for the Western States.
- CHAPMAN, Frank M., *Color Key to North American Birds* (New York, D. Appleton & Co.). Eight hundred colored illustrations of North American birds.

252 *Helpful Books on Outdoor Subjects*

- , *Handbook of Birds of Eastern North America* (New York, D. Appleton & Co.). A complete and standard guide.
- , *Our Winter Birds* (New York, D. Appleton & Co.).
- , *The Warblers of North America* (New York, D. Appleton & Co.).
- Game Birds and Birds of Prey East of the Rockies* (Garden City, Doubleday, Page & Co.). A pocket-size, illustrated guidebook.
- KEYSER, Leander S., *Birds of the Rockies* (Chicago, A. C. McClurg Co.).
- LADD, Niel Morrow, *How to Make Friends with Birds* (Garden City, Doubleday, Page & Co.). A pocket-size book containing information about bird houses, winter feeding, planting of shrubbery, and related subjects.
- Land Birds East of the Rockies* (Garden City, Doubleday, Page & Co.). A pocket-size, illustrated guidebook.
- MYERS, Harriet Williams, *Western Birds* (New York, The Macmillan Co.).
- Water Birds East of the Rockies* (Garden City, Doubleday, Page & Co.). A pocket-size, illustrated guidebook.
- JORDAN, David Starr, *Fishes* (New York, D. Appleton & Co.). A general discussion of fishes.
- JORDAN, David Starr, and EVERMANN, Barton W., *American Food and Game Fishes* (Garden City, Doubleday, Page & Co.). One of the best books on American fishes.
- SORBER, Thaddeus, *Fishes and Fish-Like Vertebrates of Minnesota*. Published at St. Paul by the Minnesota Department of Fish and Game.
- BEARD, Daniel C., *American Boy's Book of Bugs, Butterflies, and Beetles* (Philadelphia, J. B. Lippincott Co.).
- Butterfly Guide* (Garden City, Doubleday, Page & Co.). A pocket-size, illustrated guidebook.
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INDEX

Abbot, C. C., 146.
 Alder, 162, 217.
 Alfalfa, 221.
Ambrosia trifida. See Ragweed.
 Angeworm, 74, 154-155.
 Animals, as neighbors, 30; senses of, 169.
 Ants, 106.
 Ash, white, 56.
 Aspen, 56, 175.
 Asters, 8, 191.
 Audubon Societies, 132, 194.

Balance of life, 94.
 Bartram, 9.
 Bass, 25, 167, 200.
 Basswood, 56, 60, 161.
 Batrachians, 28.
 Bear, black, 15-18, 145, 171, 212;
 distribution of, 15; protection
 for, 18; grizzly, 92.
 Beaver, 172-176; dam, 172-174;
 food of, 175; tree cutting, 176.
 Beech, 58, 102.
 Bee hunter, 12.
 Beekeeper, 11, 12.
 Bees, 11, 12, 130, 201; bumble-
 bee, 136, 191; honeybee, 9-12,
 125, 221, 222; solitary, 130.
 See Honey.
 Bee tree, 12.
 Bendire, Captain, 147.
 Berries, wild, 16, 46-50. See
 Blueberry.
 Birch, 157; yellow, 101; white,
 156.

Birds, 14, 22, 46-50, 65, 68, 115,
 116, 123-125, 159, 194, 211,
 212, 224; feeding, 108-113;
 migrations of, 13, 18, 19, 49,
 152-153.
 Bismarck, 121.
 Bittern, 166.
 Bittersweet, 39, 49, 60, 61, 62.
 Blackbirds, 19; cowbird, 147-
 149; goldenheaded, 13, 153;
 redwinged, 13, 20, 21, 22, 147,
 150-151, 153.
 Blackfoot Indians, 99.
 Bladdernut, seed storage, 103.
 Blazing star, 8.
 Blights, 217.
 Bloodroot, 132.
 Bloodsucker. See Leech.
 Blowsnake, 197, 214-216.
 Blueberry, 16, 211-214.
 Bluebird, 152, 153.
 Blue grass, 158.
 Blue jay, 101, 112, 123, 150.
 Bobwhite. See Quail.
 Boltonia aster, 8.
 Bo-Peep, 136-138. See Orchids.
 Bowlders, 45.
 Box elder, 56, 121.
 Brer Coon. See Raccoon.
 Brer Rabbit. See Rabbit.
 Brown creeper, 65-67, 112, 123.
 Brush, as home for birds and
 small animals, 123-125.
 Buckthorn berry, 48. See Berries.
 Buffalo, 46, 98, 149.
 Bulbs, 102.
 Bulldog, victim of porcupine, 36.

- Bullsnake. *See* Blowsnake.
 Bulrushes, great round, grassy, 86.
 Bumblebee. *See* Bees.
 Burning bush, 37-40, 49.
 Bur oak, 60, 121-123.
 Burroughs, John, 46, 68, 142, 216.
 Butterflies, 201, 221, 222.
 Butterfly weed, 9.
 Butternut, 56.

 Camping out, 230-238; outfit for, 235, 236; rules for, 237, 238.
 Cardinal, 49.
 Cardinal flower, 9, 38.
 Carp, 25, 116.
 Cat, 6, 22, 27, 77, 84, 141, 142.
 Catbird, 49.
 Caterpillar, 221.
 Cat-tails, eaten by muskrats, 86; home of redwings, 20, 151.
 Cattle, 114, 149; horns of, 167.
 Cedar berry, 49. *See* Berries.
 Cedar birds, 47. *See* Birds.
Celastrus. *See* Bittersweet.
 Chickadee, 65, 108-110, 123.
 Chipmunk, 141-144.
 Chippewa Hard. *See* Plums.
 Chippewa Indians, 34, 52, 190, 206, 212, 225.
 Chippewa Red. *See* Plums.
 Cicada, 202, 203.
 Cicada-killer, 201-205.
 Composite family, of flowers, 8, 191.
 Coneflowers, 8.
 Coon. *See* Raccoon.
 Coot. *See* Mudhen.
 Copperhead, 197-199.
 Cottonwood, 55, 60, 157.
 Cow, 158.
 Cowbird, 147-149. *See* Black-birds.

 Coyote, 92-94; as menace to game, 93.
 Crab. *See* Sand crab.
 Crayfish, 51, 115.
 Cree Indians, 101, 212.
 Creeper, 65-67, 112, 123; food of, 66; home of, 67.
 Crow, 123, 150.
Cypripedium candidum. *See* Bo-Peep.
Cypripedium spectabile. *See* Moccasin, flower.

 Darwin, 137, 154.
 Deer, 30, 78-82, 114, 145, 167-169; protection for, 79, 81.
 De Soto, 4.
 Devil's Hole, 180.
 Dobson fly, 199-200.
 Dog, 6, 27, 54, 77, 84, 98, 119, 172; attacked by eagle, 91.
 Duck, domestic, 30, 84; wild, 18, 26, 103, 116, 117, 152, 159, 165, 185.
 Duffel, for camping, 234.
 Dunes. *See* Sand dunes.

 Eagle, 87-92; nest of, 87-89.
 Eaglet, 89.
 Earthworm. *See* Angleworm.
 Easter flower. *See* Possblummies.
 Elderberry, 211.
 Elk, 30, 145, 167.
 "Elkdog," 99.
 Elm, 56, 57, 58, 60, 161; white, 57.
 "English flies," 9.
 Erosion, water as force of, 160, 180.
Euonymus atropurpureus, 40. *See* Burning bush.
 Evergreens, shape of, 60.

- Fabre, Henri, 203.
Fagus. See Beech.
 Farkleberry, 214. See Blueberry.
 Feeding boxes for birds, 113.
 Feeding grounds, of migrating birds, 19.
 Ferns, 201, 217-220; reproduction of, 219, 220.
 Fires. See Forest fires.
 Fishes, 25, 26, 51, 115; Age of, 28.
 Fishing, through ice, 26.
 Fishhawk, 92.
 Flax, 40.
 Flowering plants, 217.
 Flowerless plants, 217.
 Flowers, wild, 7, 8, 131-132, 201; danger to, from fires, 159. See Aster, Composite family, Orchids, Violet.
 Fly, 72, 233, 234, 237.
 Flycatcher, 148, 152, 194.
 Flying squirrel, 125.
 Forest fires, causes of, 105; damage from, 57, 79, 106, 157, 158-160.
 Forest ranger, 10, 135.
 Fort Little Niagara, 180.
 Fort Niagara, 179.
 Fort Schlosser, 179, 180.
 Fort Snelling, 187.
 Fox, 22, 31, 54, 82-84, 169, 171; den of, 82, 83.
 Fox sparrows, 42.
 Frog, 26, 27, 28, 51, 68-70, 115, 117, 152; hibernation of, 68; plague of, in Egypt, 29.
 Fruit, wild, 16, 47, 211-214, 225-227.
 Fungi, 217.
 Fur bearers, 50, 115; protection for, 50. See Beaver, Mink, Muskrat, Opossum, Raccoon, Skunk.
 Game, protection of, 25, 79, 81, 116.
 Garden slug. See Slug.
 Geese, wild, 152, 185.
 Gentian, 9.
 Glacier, continental, 45, 100.
 Goat Island, 185, 187.
 Golden-headed blackbirds, 13. See Blackbirds, golden-headed.
 Goldenrod, 8, 136, 191.
 Goldfinch, 42.
 Gopher, 29, 31, 84, 207.
 Granite, 45.
 Grape, wild, 60, 61, 115, 226.
 Grasses, species of, 191.
 Gray squirrel, 7, 31, 32-34, 125.
 Groundhog. See Woodchuck.
 Grouse, 26, 49, 61, 159.
 Gulls, 227-229.
 Gunflint Lake, Hermit of, 135.
 Hackberry, 49, 60.
 Harte, Bret, 196.
 Hawk, 94, 150. See Osprey.
 Hazel, 106, 217; catkins, 61.
 Heather, or heath, 7.
 Herring gulls. See Gulls.
 Herons, 152, 167.
 Hermit of Gunflint Lake, 135.
 Hemlock, 102.
 Hemp, wild, 40-42.
 Hickory, 56, 58.
 Hives, for bees, 10.
 Hog-nosed snake. See Blow-snake.
 Hollow trees, as homes for wild things, 10, 12, 32, 43, 51, 125.
 Honeybee. See Bees.
 Honey, wild, 9, 11, 12.
 Hornet, 71. See Wasps.
 Horse, 96, 98-100.
 Horseshoe Falls. See Niagara.
 Hudson, Hendrik, 4.
 Hummingbirds, 9.

- Inca people, 98.
 Indian Orchard, 225-227.
 Indian paint brush, 8.
 Indians, 9, 10, 34, 37, 39, 53, 62, 78, 79, 98, 99, 103, 120, 133-134, 150, 155, 174, 181, 185, 188-190, 212, 213, 225-227. *See* Blackfoot, Chippewa, Cree, Iroquois, Seneca.
 Inky mushroom. *See* Mushroom.
 Insects, 14, 19, 69, 146; as enemies of plants, 220; as visitors of flowers, 136, 191; stages of life of, 199.
 Iroquois Indians, 188, 190, 225.
 Itasca, Forest, 6, 37, 114, 143, 162, 174; Lake, 8.

 Jack-in-the-pulpit, 49, 102.
 Jacquin, 40.
 Jay, 101, 112, 123, 150.
 Junco, 42, 49.
 June berry, 226.

 Kingfisher, 13, 14, 166.

 "Land of Little Sticks," 101.
 Lark, meadow, 84.
 Leech, enemy of snapping turtle, 166.
 Lewiston, N. Y., 179, 180, 181, 186, 187.
 Limestone, 45.
 Lincoln, 121.
 Linden, 56. *See* Basswood.
 Llama, 98.
 Lobelia, scarlet, 9, 38.
 Lower Rapids, 187. *See* Niagara.

 "Maid of the Mist," 184.
 Mallard, 13, 18. *See* Duck, wild.
- Mammals, 68, 144; Age of, 28.
 Maple, 104, 161, 217; sugar m., 56, 60, 101.
 Marigold, bur, 8.
 Martin, 14.
 Meadow lark, 84.
 Mice, 3, 31, 62, 114, 169, 202, 212, 224.
 Migrations of birds, 13, 18, 19, 49, 152-153.
 Milkweed, 136, 220-222.
 Mink, 22, 70, 115-118, 169.
 Minnows, 14.
 Moccasin, flower, 131, 136, 137, 191-193. *See* Orchids.
 Mollusks, 73-75.
 Moonseed, 48, 49, 61, 62.
 Moose, 3, 30, 167, 170.
 Mosquito, 221, 231-235.
 Mosses, 217.
 Moths, 192, 221.
 Moulds, 217.
 Mountain ash, 46, 47; berry, 162.
 Mudhen, 19, 116, 117.
 Muir, John, 56, 196.
 Mushrooms, 5, 6, 22-24, 75, 217; inky m., 23-24.
 Muskrat, 85-87.
 Musquash, 85. *See* Muskrat.
 Mycelium, 24.

 Nansen, 100.
 Nighthawk, 14, 208-211, 214.
 Nightshade, 221.
 Night walkers. *See* Angeworms.
 Niagara, Falls, 182, 185-188, 229; Gorge, 179-186, 183; Trail of, 179-180.
 Norway pine. *See* Pines.
 Nuthatch, 65, 66, 112, 113, 123.

 Oak, 58, 101, 103, 121; bur, 60, 121-123.

- Opossum, 144-147.
 Orchids, 131, 136-138, 191-193;
 Bo-Peep, 136-138; moccasin,
 191-193.
 Oregon Trail, 96.
 Osprey, 92.
 Owls, 22, 94, 123, 150.
 Ox, 95-97, 98.

 Pansy, 134, 135.
 Panther, 145.
 Pasqueflower. *See* Possblummy.
 Peckham, George, 203.
 Perch, 25, 89.
 Pickerel, 25, 26, 152, 167.
 Pincherry, 226.
 Pines, 56, 58, 101; Jack, 60;
 Norway, 56, 104, 107; Scotch,
 162; white, 56, 104.
 Pipestone quarry, 46.
 Plant, reproduction, 136; signa-
 tures, 217.
 Plums, wild, 226-227.
 Poison ivy, 49, 220.
 Ponce de Leon, 3.
 Poplar, 101, 104, 217.
 Porcupine, 34-37, 43, 119, 169.
 Possblummy, 129-131
 Powell, Major, 187.
 Prairie chickens, 159.
 Prairie dog, 92, 94, 207.

 Quail, 111-113, 138-140, 159; nest
 of, 139-140.
 Queen bee, 12.
 Quick, Herbert, 129.

 Rabbit, 31, 62, 75-77, 92, 125,
 141; jack, 94; snowshoe, 91.
 Raccoon, 50-52, 125, 145.
 Ragweed, 222-225.
 Rattlesnake, 197, 215.

 Red Jacket, 188.
 Red squirrel, 5-7, 32, 125, 141,
 150, 164.
 Redwinged blackbirds. *See* Black-
 birds.
 Redwings. *See* Blackbirds.
 Reptiles, age of, 28.
 Resin, as prophylactic, 114; in
 forest fire, 115.
 Robin, American, 47, 49, 149, 152,
 153, (nest of) 163-164; Eng-
 lish, 164.
 Roots, perennial, 102.
 Rushes, 20. *See* Bulrushes, Cat-
 tails.
 Rusts, 217.
 Rice, wild, 20, 102.

 Salamander, spotted, 27-29, 68.
 Sand crab, 207-208.
 Sand dunes, 205, 206, 208.
 Sandstone, 45.
 Sand viper. *See* Blowsnake.
 Santa Fé Trail, 96.
 Sapsucker, 161-163.
Scirpus fluviatilis, 86. *See* Bul-
 rushes.
Scirpus lacustris, 86. *See* Bul-
 rushes.
 Sea gulls. *See* Gulls.
 Seaweeds, 217.
 Seeds, 157, 184; distribution of,
 100-101; storing of, 102-104.
 Seneca Indians, 179, 188.
 Sequoias, 56, 57; 114.
 Shadbush, 106.
 Shaggymane, 23. *See* Mushroom.
 Shakespeare, 218.
 Shale, 45.
 Sharpe, Dallas Lore, 146.
 Sheep, 114, 167.
 Shiras, Judge, 78.
 Showy moccasin, 191-193. *See*
 Orchids.

- Shrew, 202.
 Sioux Indians, 53, 81.
 Skunk, 27, 31, 34, 42-44, 84, 166, 223.
 Slug, 73-75.
 Smith, Captain John, 206.
 Smuts, 217.
 Snails, 73. *See* Mollusks.
 Snakes, 23, 84, 119, 196-199. *See* Blowsnake, Copperhead, Rattlesnake.
 Snapping turtle, 165-167..
 Sneezeweeds, 8.
 Soils, 44-46; favorable for trees, 55, 56, 122, 155.
Solanin, 221.
 Sparrows, 147, 148.
 Spores, of ferns, 219, 220; of mushrooms, 24.
 Spring, rate of advance, 153.
 Spruce, 101, 156; black, 56.
 Squirrels, 3, 33, 101, 110, 169; flying, 125; gray, 7, 31, 32-34, 125; red, 5-7, 32, 101, 125, 141, 150, 164.
 Stone Age, 188.
 Sumac, 49, 211.
 Sunfish, 14.
 Sunflower, 8, 191; seed, 113.
 Swallows, 14, 19.
 Swifts, 14.
 Sycamore, 57.

 Table Rock, 186.
 Tamarack, 56, 156, 169.
 Teal, blue-winged, 13.
 Tent, 16, 230, 231, 232.
 Teepee, 39.
 Thimble-berry, 184.
 Thistle, 8.
 Thompson Seton, Ernest, 51, 81.
 Thoreau, Henry, 206.
 Thorn apple, 226.
 Three Maidens, 46.

 Thrushes, 49, 148.
 Thundering Falls. *See* Niagara.
 Toad, 27, 28, 68.
 Toadstool, 22, 23, 24.
 Torrey, Bradford, 4.
 Trapper, 15, 30, 92, 116, 118, 120.
 Trees, 21, 56, 58, 60, 101, 103-106, 114, 120-123, 175; destruction of, 104-108, 158; dominant, 58; fruit-bearing, 211; growth of, 55-57; planting of, 155-158; suppressed, 58; troubles of, 113-115. *See* Hollow trees.
 Trout, 175.
 Tulip tree, 58.
 Turtle, 26. *See* Snapping turtle.

 Uncle Remus, 50.

Vaccinium corymbosum. *See* Blueberry.
Viola tricolor. *See* Pansy.
 Violets, 133-134.
 Vireo, 194.
 Vines, 60-62; grape, 61, 115, 226. *See* Bittersweet, Moonseed.

 Wahoo. *See* Burning bush.
 Walker, Dr., 57.
 Walnut, 58; black, 56.
 Walton, Izaak, 26.
 Warblers, 14, 49, 147, 194; yellow, 101, 147, 153.
Waschbaer. *See* Raccoon.
 Washington, 121.
 Wasps, social, 71-73, 221, 222; solitary (*See* Cicada-killer).
 Waxwings, 49.
 Weasel, 22, 169.
 Whirlpool Rapids, 187, 229.

- White elm, 57.
White oak, 60.
White pine. *See* Pines.
Widmann, Otto, 149.
Wild cat, 145.
Wild cherry, 211.
Wild Flower Protection Societies, 132.
Wild honey. *See* Honey.
Wild plums, 226-227.
Willow, 55, 56, 67, 101, 104, 157, 217.
Wolf, 54, 78, 92, 145, 168.
- Woodbine, 60, 61.
Woodchuck, 53-55, 84, 223.
Woodcock, 25.
Wood nettle, 40.
Woodpecker, 32, 65, 66, 112, 123, 161.
Wood thrush, nest of, 194-196.
- Yellow-headed blackbird, 153.
See Blackbirds, golden-headed.
Yellowjacket, 71. *See* Wasps.
Yellow warbler, 101, 147, 153.

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